PUBLICATION OFFICES:
168-177 POTTER BUILDING, NEW YORK.
Telephone Call: Murray 586. Cable Address: "Electrical," New York.

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Matter for the Editorial Department should be addressed to
The Editor of The Electrical World, New York.
Subscriptions and communications relating to Advertising or the Business Department should be addressed to
W. J. JOHNSTON, Publisher,
Potter Building, New York,
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Vol. IX. NEW YORK, APRIL 9, 1887. No. 15.

New Advertisements.

In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue: PAGE.

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ONE of the Buffalo papers calls on its readers to engage in a new crusade, and to begin at once the "holy work" of cutting down wires and poles. The citizens have not yet followed his advice, or it is likely there would have been a fiery Buffalo editor seeking some poor electrician to devour because the telegraph, telephone or district messenger service had been interrupted. To call the destruction of property "holy," especially when that property is subserving public convenience, is the worst kind of socialism that has yet made its appearance.

A GLANCE at our Patent Record this week reveals not only great activity in electrical invention, but extreme diversity. The patents enumerated include new applications in the telegraph, telephone, electric electric light, railway, secondary battery, underground conduit, dynamo, voltmeter, conductor, arc light carbon, burglar alarm, lightning rod, insulator, primary battery, air brake, and a few more subjects upon which inventive genius still finds a chance to exert itself. As usual there is a notable absence of novelties in the application of static electricity.

THE reports we publish from England as to the growing use of the secondary battery there, and the many items as to its increasing vogue in this country, indicate a most hopeful state of affairs. In train lighting alone there is an enormous field for the battery to occupy, but the demand comes from a dozen other departments as well.

WE bring to a close, in this week's issue, Prof. Silvanus P. Thompson's long and extremely able paper on telephonic investigations. One wonders in reading it how Professor Thompson, in the midst of all his other work, can find time for these researches; yet he does it, and is as well at home in discussing the minute details of telephonic apparatus as in explaining the obscurer principles of dynamo-electric machinery. The paper is, naturally, full of controversial matter, but is none the worse for that, and may well be looked upon as marking an important stage in the evolution of true telephonic theory and of the perfect telephone.

ELECTRICIANS who incline to betting have an opportunity to enjoy a little excitement by getting a few dollars on the race that is to come off this summer between the Reckenzaun electric launch "Volta" and the Elieson launch now building. Both will be driven by motors and accumulators, and the course will be across the English Channel from Dover to Calais and back. The loser is to pay out $250 in charities. Hereafter, we think, no yachting regatta ought to be considered complete without an electric launch contest. It will be remembered that the "Volta" has already made this trip with great success and éclat.

INTERESTING as is the experiment described on another page by Mr. Blakeney, it is not new. Crosse, in England, as far back as 1840, utilized this principle of surface tension in liquids under the influence of the current for the imitation of "constant" and "intermittent" springs. Wiedemann also took up these experiments and constructed an apparatus closely analogous to that of our contributor, using a platinum electrode, instead of mercury, and he arrived at a number of interesting laws governing this action. These laws, however, only hold good for fluids of the same nature. When different fluids are subjected to the action of the currents, the mechanical action is greatest upon those which oppose the greatest resistance to its passage. This explains why the water, being more powerfully acted upon on account of its greater resistance, forces itself under the mercury into the glass tube. Our contributor will probably have also noted that the motion of the fluids is from the positive to the negative pole.

ELECTRIC RAILWAYS are now running, or building, or under contract in New York City, Philadelphia, Baltimore, Boston, San Francisco, Detroit, Ansonia, Conn.; Montgomery, Ala.; Pittsburgh, Los Angeles, Cal.; Denver, Col.; Windsor, Can.; Scranton, Pa.; Carbondale, Pa.; Ithaca, N. Y.; Binghamton, N. Y.; Lima, O.; Appleton, Wis.; Orange, N. J.; Kansas City, St. Louis, Chicago and Cincinnati. Some of these places will soon have two or three roads running. There are also scores of places where roads are seriously proposed, like Newton, Mass.; Bangor, Me.; Selma, Ala.; Birmingham, Ala.; San Diego, Cal.; Atlanta, Ga.; Jacksonville, Fla.; Reading, Pa.; Brooklyn, N. Y.; and Jersey City; and a great many other places might be mentioned if the negotiations were ripe enough to admit of publicity. Last year it was said on this page that 1887 would see at least fifty electric railways in operation or construction in the United States. The prophecy was laughed at. We still stand by it and feel inclined to raise the limit.

WITH the steady improvement in the storage battery an interesting problem is now forcing itself upon the attention of electricians. The question whether it is cheaper to transmit electric energy from central station to consumer by means of wire or by means of a horse and cart may in the near future be one for earnest consideration. In fact, we know of a case to-day in which the latter method is seriously contemplated by an eminently shrewd and practical electrician. In a recent paper read before the Society of Telegraph Engineers and Electricians, Mr. Desmond Fitz Gerald showed that with the most improved storage cell about 48,000 foot-pounds of energy per pound of lead could be stored, and by the use of his plates composed of lithanode he suggests a means of lessening the weight of material to be transported. This consists in sending the charged plates to the house in proper receptacles, and removing the discharged plates in order to recharge them. The positives would be conveyed in a closed receptacle and in a damp state, while the negatives would be conveyed in a dry state. Sufficient sulphuric acid would also be taken along in carboys. This would avoid the conveyance of the vessels containing the plates; and it would render unnecessary the use of direct main conductors. For each electrical horse-power supplied, Mr. Fitz Gerald estimates that about 45 lbs. of battery plates would have to be transported a distance not exceeding half a mile. This would supply three 20-candle lamps for five hours. A ton of plates distributed would give 56 electrical horse-power; and the cost might, he considered, be from 10 to 25 cents per horse-power per hour, according to the circumstances of the case. Of course, the question again arises as to how far from the central station this method of distribution can be practically carried out, and we are thus confronted with the same problem as is presented in a distribution by means of conductors. That there are occasions and situations, however, where the method can be practically applied, there can be no doubt of. We need only refer to the cities where the stringing of wires has been forbidden and where, lacking underground facilities, some other method of distribution must be adopted. For such cases, the method above described certainly has a field of application, and, as we have stated before, it is already seriously contemplated.

THE study of the limits of potentials dangerous to life has recently been taken up again by M. d'Arsonval, who has devoted considerable attention to this subject, and his latest conclusions are decidedly interesting. The old rule that 300 volts is the danger limit, is, according to M. d'Arsonval, too small a figure. His experiments give 500 volts as the danger line for continuous currents. This, of course, does not include the extra current which might be generated in such a circuit and which can prove fatal. While the limit for continuous currents is thus raised, M. d'Arsonval, contrary to the opinion of electricians on this side of the water, gives only a small range for the alternating current, which, he says, ought not to exceed 60 volts for safety. It is interesting also to note that the cause, or rather the mechanism, of death varies with the nature of the electric current employed. Thus with the extra current or alternating currents, there is no anatomic lesion whatever, and the person shocked can, as a rule, be revived by applying artificial respiration. On the contrary, the discharge of a battery of Leyden jars causes a disorganization of the tissues which renders all attempts at resuscitation fruitless.

IN his charming little work on "The Library," Andrew Lang, by way of earnest advice, says: "The book collector must avoid gas, which deposits a filthy coat of oil that catches dust." This is strong, and yet it does but second Mr. Blades, the well-known bibliographer, in his statement that three jets of gas in a small room soon reduced the leather in his book cases to a powder like snuff, and caused the backs of the books to break away from the inside when he touched them. This destructive effect of gas on books has, in fact, long been known, but that the same effect is experienced with pictures has not so generally attracted attention. We think, however, that the vigorous article by Mr. Rush C. Hawkins, in the April number of the *North American Review*, will startle a great many wealthy people who have calmly been ruining their own choice canvasses with gas. At a time when the sale of the great Stewart collection of paintings is engrossing thought and conversation, the *Review*, with its usual timeliness and prescience, thus gives publicity to an article of the first importance as regards the preservation of these pictures, for which $40,000 or $50,000 each is paid, and which, in some cases, are becoming public property. Mr. Hawkins, whose sincerity in the matter no one can question, states that pictures to the value of hundreds of thousands of dollars are being ruined in New York alone. He quotes from Mr. George Wallis, of the South Kensington Museum, as to the damage of pictures there by gas, and cites the opinion of Mr. C. L. Eastlake, of the English National Gallery, who asserts, "without hesitation," that "gas lighting under ordinary conditions has an injurious effect upon oil paintings." Mr. Hawkins then goes on to speak in detail of various collections in this country, embracing works by Gerome, Cabanal, Ary Scheffer, Fortuny, Meissonier, Vibert, Alvarez and other celebrated artists, in which the sad and wretched work of destruction by gas can be easily traced. Of one gallery he says: "This collection is in a house which contains a very liberal supply of the three most potent factors in the way of manufacturing foul air and disease—the furnace; means of an unlimited outpour of illuminating gas; and many pots of damp-producing plants." Another ten years and those pictures will, in his opinion, be absolutely worthless. In the case of two pictures by Gerome and Cabanal, in the Corcoran gallery at Washington, he considers the work of restoration to be of very doubtful success; and in yet a third instance, of pictures in this city, he states that the result of chemical action upon the pigments is only the question of a very short time. The article is one that deserves general attention and will certainly be widely read. It will, we think, give an impetus to the use of electric lights in picture galleries, artistic rooms, and the interior of the House Beautiful; and it should also give a wider field to the electric temperature regulator, by means of which the air can be kept at the right degree of warmth. Surely they who are now spending large sums of money for paintings and engravings and books—to say nothing of furniture, carpets and tapestries—do not wish to see their treasures cracking and fading and rotting away under their very eyes.

NEW BOOKS.

Elektricitaet und Magnetismus als Kosmotellurische Kraefte. By Dr. Theodore Hoh. Vienna: A. Hartleben. 1887. 5½ × 7½. Paper. Price, $1.

Electricity and magnetism as cosmo-terrestrial forces have long been the subject of close study and comparison, and yet we can hardly say that the relations which the various phenomena bear to each other, and their interdependence, are so fully demonstrated that we can formulate the laws of their action. The author of the present volume, which constitutes No. 37 of the excellent series known as the *Elektrotechnische Bibliothek*, has treated the subject under discussion from the standpoint of a reviewer or statistician, who compares the results obtained by various observers, and draws inferences affecting their relative reliability. His long service as a meteorological observer, whose work has been embodied in our own Signal Service Reports, enables him to view the subject in a broad light.

The magnetic properties of the earth's crust, its distribution and its effects upon the magnetic needle form the subject matter of the first part of the book, and give an interesting insight into this vast field for research. The aurora, and its connection with terrestrial magnetic phenomena, are also discussed at length.

The second part of the book, and the most important, treats of a variety of subjects in relation to earth currents, atmospheric electricity, the electricity of the clouds, ozone, etc. The author discusses the various theories regarding the probable origin of all these phenomena, and their relation to one another as well as to the disturbances in the shape of storms, thunder and lightning. The discussion of the propagation of storms and their significance as equalizers of the electric potential on the earth's surface, is a most interesting addition.

Finally, we find a short chapter on cosmic electricity, solar electric currents and the electricity of the interstellar space. The author has throughout called to his aid statistics bearing on the subject treated, and his copious references, which show a careful research, are a valuable adjunct for the student. Altogether, this must be considered one of the best numbers of the *Bibliothek*.

Kalender fuer Elektrotechniker. By F. Uppenborn. Munich, R. Oldenbourg. 1887. 252 pp.

This pocketbook, designed for the use of electrical engineers, may lay claim to having within its covers a large amount of useful information, in an available form. It is not strictly an "electrician's pocketbook" in the sense in which that term is usually employed, but it conforms to the difference which is gradually being recognized to exist between the electrical engineer of to-day and the electrician of old. Hence we find considerable collateral matter such as all engineers frequently refer to, in the shape of mathematical formulæ, divisions pertaining to mechanical construction, physics and mechanics and matters of general technical interest.

The purely electrical part is a well-worked-out condensation of the principal problems which come to the electrical engineer, and, under various subheads, deals with electric measurements, electric light, electro-chemistry, transmission of power, etc. Each of these is again divided into various subjects. It has evidently been the author's aim to provide a pocket-book which should make reference to a number of other books unnecessary to the electrical engineer engaged in a variety of work, and in this he has succeeded. We might suggest that one based on a similar idea and printed in English would be of great value to many of our readers.

Practical Electricity. By W. E. Ayrton, F. R. S. New York: Cassell & Company, 1887. 5 × 7½, 516 pp. Illustrated. Price, $2.50.

This volume comprises substantially the first year's course for Professor Ayrton's pupils at the City and Guilds of London Central Institution. The author has retained to a great extent his lecture room methods in the printed work. That is to say, the laboratory is his constant reference here as there, the experiment teaching what it is simply the office of language afterward to formulate. In other words, Professor Ayrton's experiments are not designed to illustrate the text, but the text puts into formal shape the results of his experiments. This treatment has been employed designedly. Professor Ayrton explains himself on this point in his preface, as follows:

"One of the great difficulties experienced by people in mastering the *quantitative* science of electricity, arises from the fact that we do not number an electrical sense among our other senses, and hence we have no intuitive perception of electrical phenomena. During childhood we did not have years of unconscious experimenting with electrical forces as we had with the forces connected with the sensations of heaviness and lightness, loudness and softness, heat and cold. Beyond a shock or two taken perhaps from some medical galvanic apparatus, or from a Leyden jar, our senses have never been affected by electrical action, and hence we ought to begin the study of electricity as a child begins its early education. Quite an infant has distinct ideas about hot and cold, although it may not be able to put its ideas into words, and yet many a student of electricity of mature years has but the haziest notions of the exact meaning of high and low potential, the electrical analogies of hot and cold. That it is desirable that students should learn physics, as they learn to ride the bicycle, by experimenting themselves, is now generally admitted, and this is especially true in the case of electricity, since it is by experimenting, and *only* by experimenting, that a student can obtain such a real grasp of electricity that its laws become, so to say, a part of his nature."

Acting on the principle here set forth, Professor Ayrton first gives, for example, the details of certain experiments which illustrate the effects of electric currents and then passes to the definition of the *ampère* or unit of current. And so throughout the book the experiment precedes and the definition follows. How much clearer this is than the opposite method need not be explained to any reader of scientific books, nor to any worker in the laboratory. "Volts" and "farads" are not mere definitions to the student of Professor Ayrton's work, but clear conceptions, such as only the sense of handling can give.

In this book the reader gets, too, the experiments of one who is not contented with the old results nor the old apparatus. The student is, rather, admitted into the laboratory of a fresh thinker and an inventor of world-wide reputation. In a word, there is little in the book which is not commendable and much that is of the highest excellence. An admirable feature, too, is that the illustrations are nearly all new and of the utmost clearness and pertinence,

The author's use of the capitals P. D. for "difference of potential" or "potential difference" will, we think, be generally approved as being a convenient substitute for an unwieldly phrase.

The Value of Pole Pieces in Dynamo Construction.

BY R. S. DOBBIE.

Following the interesting discussion on the form of field magnets in recent issues of The Electrical World, I would like to contribute some points that have come under my own observation that I think are of general interest.

In fields of the "consequent pole" construction, it must

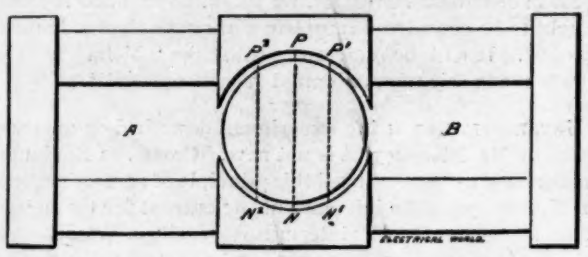


Fig. 1. Value of Pole Pieces in Dynamo Construction.

be assumed that both magnets are of the same strength, this being necessary to insure an approximately uniform distribution of the "lines of force." But this desideratum, striven for by so many constructors, may not seem such a matter of course when we consider the many factors of error in the case.

To begin with, we have inaccuracy of mechanical construction, which allows a difference in the mass of the two magnets. Then, more or less perfect joints can introduce more or less resistance in the magnetic circuit, and the number and magnetic effect of the coils, and the current in them, may be factors that prevent equality.

Now, let us take into consideration the vicissitudes of use and abuse; the insulation becomes defective, wires and cores become heated, and then we have an array of causes that singly or combined, and troubles generally combine, are enough to upset the most carefully considered plans

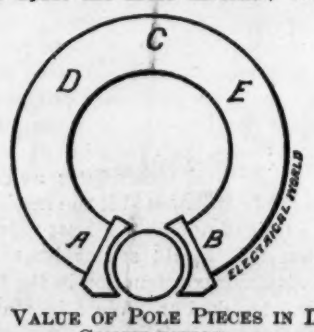


Fig. 2. Value of Pole Pieces in Dynamo Construction.

of the laboratory. Indeed, I wonder at the fact that so many constructors use the "consequent-pole" arrangement when the single magnet, as in the Edison and others, gives *at least* as good results, is simpler, cheaper and less likely to be affected by derangement.

Referring to the accompanying diagram, Fig. 1, if the strengths of the magnets *A* and *B* are exactly similar, we will get a field symmetrical in relation to the line *P N;* but if they are not, and this if far more probable, the lines of force would be thicker in the direction of P^1 N^1 or P^2 N^2, as the case may be.

The following experiment upon a machine of the above type may be interesting. The dynamo was a shunt wound machine with a separate derived circuit on each set of magnets *A* and *B*. In one of these I inserted a small resistance, still leaving both in circuit with an adjusting rheostat; I also fitted a short-circuiting switch across this resistance. Having adjusted the brushes to the point of least sparking, and with the E. M. F. and current kept constant, I opened the switch, thereby introducing the resistance, with the effect of vicious sparking at the collector, the E. M. F. and current remaining the same as before, by using the adjustable rheostat. I varied this in many ways, but always with the same result.

There is another form of consequent pole that is not affected in this way: I refer to the Gramme and Schuyler form, where the axis of the armature is parallel to that of field magnets. Here a want of symmetry in the direction of the axis of the armature would mean that one *portion of wire* on the armature would be under the influence of stronger induction than another part of *the same wire*.

Referring to Mr. Townsend Wolcott's paper in The Electrical World of March 5, I do not at all agree with his criticism on the Jamin form of magnet, such as that used by the Mather Company. Granting that "the wire at *C*, Fig. 2, has no other effect than to neutralize the external field of the other wire," surely this is *useful effect*, as it prevents leak of lines of force from *D* to *E*, and as they must come out somewhere it is natural to suppose they cross from *A* to *B*, where, in fact, they will do most good. Here is a form of magnet that is without joints, and of a form that allows minimum leakage and allows of easy construction of wrought iron, which every magnet should be; but I would hate to wind 20 miles of wire over one on a quiet Sunday afternoon—by hand.

As to yokes being of "smaller value than generally supposed," then the modern principle of having a magnetic circuit as complete as possible and of the best quality must all be nonsense, and the labors of such men as Crompton, Kapp and Hopkinson and Weston, have been in vain.

The advantages of having the magnets "end on" to the armature has been recognized far back by writers and constructors, but I cannot think of any who have ignored the concentrating influence of iron or attribute any advantages to a dynamo that could run without it (except perhaps alternating machines), nor do I see that the capability of the Thomson-Houston machine to run without iron is any recommendation, especially when we consider that the weight of copper on the armature is 3 or 4 times that of other machines of the same capacity and efficiency when the iron "is there."

"Crossfire" on Electrical Circuits.

BY THOS. D. LOCKWOOD.

Although I have very little spare time at my disposal, I feel that I should be remiss if I did not notice in some way the interesting communication, bearing the above title, appearing in The Electrical World of March 12, with the sign manual of Mr. Stephen D. Field.

A communication upon any electrical subject from Mr. Field must command respect, and it is only with respect of the highest and profoundest character that I beg to make a rejoinder.

I do not hold Mr. Field responsible for the nondescript word "crossfire," since it is evidently somebody else's word, which he uses because he finds it convenient. I also use it as a title for this paper because he has used it, and because I wished by its use to link my feeble remarks to the same subject. I do not, however, make it mine; but, on the contrary, I protest against this and every other word that shows a tendency to mar the purity and forcefulness of the English language. It is presumed to mean any interference between two or more working electrical wires, by which the signals or variations of the electrical condition of any of the wires are caused to effect a like change in the other or others.

Many gentlemen, myself included, have been associated with the telephone for a number of years. It is, therefore, supposable that during these years we have studied the disturbances that affect telephone and other lines; and it is also supposable that some of us may have studied them with sufficient persistence and care to have determined their causes with some degree of accuracy.

As far back as 1882, I wrote for *The Operator* a paper which was the result of considerable painstaking experience. This paper was entitled "Disturbances Experienced on Telephone Lines," and was some months later reproduced in my little book, *Practical Information for Telephonists*.

The principal disturbances of telephone lines were there discussed, and at least to a certain extent elucidated and classified.

There can be no doubt that all the causes mentioned in that article do bear their part in these disturbances.

These are: earth currents; atmospheric electricity; leakage from common earth terminals; *leakage from wire to wire;* and induction.

In the autumn of 1884 I presented a paper to the Electrical Conference at Philadelphia upon the same subject, which, while embodying some of the views of my former paper, comprised also new deductions, and more elaborate discussion of the above causes.

I am thus in accord with Mr. Field, so far that I quite agree with him that leakage from wire to wire is *one* of the causes of the interference that frequently prevails between telephone wires, or between telephone wires and other wires.

But this granted, it is unfortunately too true, that were all the other causes of disturbances removed, there is enough actual induction left behind to be a most energetic nuisance.

Mr. Field says, "Crossfire is greatest when the pole resistance to earth is greatest, that is, on a hot dry day."

This to my mind is an evidence of induction. If the dry hot day increases the resistance of the poles, it will also increase the resistance of the cross arms, and remove the tendency of the insulators to leak. All experiments

in induction will work better when the appliances are dry. When I was engaged in the service of the Gold & Stock Telegraph Co. in New York, we frequently had cases of apparent cross, where there was no metallic contact, but these were always on *wet days;* and in the book of instructions this phenomenon was called "weather-cross."

This was purely leakage; and this is indeed remedied by applying ground wires to the poles, as described in Highton's British Patent of Jan. 29, 1852. Yet, I think, to perfect the insulation is a better plan.

Mr. Field's second reason in favor of the leakage monopoly is:

2. "It appears on sections of line far too short to admit of inductive discharge being accepted as the explanation."

Does it? I have stretched a wire four feet long and connected it with a galvanometer, and I have stretched another of equal length parallel to the first and connected it with a Morse key and two cells of gravity battery, and pulsations of electricity were quite apparent on the galvanometer, upon opening or closing the key.

I have stretched 50 feet of silk-covered wire on a hard rubber frame and closed its circuit through the secondary coil of a Blake transmitter, and holding a coil of similar length including a receiving telephone over the first, have heard the conversation transmitted from a distant room quite distinctly.

I have two flat coils of silk-covered wire, each tightly inclosed in a hard-rubber case, one placed in circuit with a Blake transmitter, the latter being in a distant room; and the other closed through a telephone, and I have plainly heard speech, even when I have lifted the one coil in my hand twelve inches from the other in the air. In view of these trials I am compelled to believe that the second reason has no force. In the third place, it is held as a reason in favor of leakage, that "it gives the most trouble when but few wires are on the poles, and can in most cases be eliminated by good earth connections on every cross arm."

As to the first proposition, this equally holds good with induction. Not because the currents induced by any given wire must necessarily be divided between the remaining circuits, but because the inducing current can in any event only do a certain amount of work. In other words —suppose four wires: No. 1 is working, and induces a current in Nos. 2, 3 and 4; but each of these induced currents must and does also react, not only upon No. 1, but also upon each of the others, and the reactionary currents again react, and thus not only is the original current in No. 1 weakened, but the induced currents also tend to weaken one another, and these effects are of course the more pronounced as the wires increase in number.

As to the second proposition, it is true *where* the chief disturbing element *is* leakage; and this should never be, if the lines are properly insulated. The first telephone line between Boston and Providence, forty-four miles in length, comprehended some dozen wires, and was fitted with earth wires under the assumption that a major part of the disturbance was due to leakage; the interference between the lines was indeed lessened, but not totally eliminated, and a new trouble appeared.

The earth by means of the ground wires was brought so near to the lines that the electrostatic capacity of all the lines was greatly increased, and retardation of signals, showing by a muffled conversation, was the result.

Reason 4 seems to be substantially a converse method of stating the first proposition of reason 3, and I think requires no further comment.

In view of these considerations it seems to me that it is not a specially difficult task in any given case to determine absolutely under which head we should class the disturbance. If a current flowing in one line acts upon another line by leakage, the action must be at least in some degree continuous, while the original current is present in its own line. But an induced current only appears in the second line during the moment of change, as, for example, upon the opening as well as upon the closing of a key upon No. 1.

If, however, we allow leakage to be the sum total, or even the chief cause of disturbance between telephone lines, why may we not then proceed to show that leakage it also is which generates the telephonic currents in the secondary helix of the induction coil of a Blake transmitter when we vary the strength of current in the primary coil?

Why, also, may we not ascribe to leakage the electrostatic effects of the operation of a Ritchie or Ruhmkorff induction coil, or the generation of currents in a dynamo-electric machine?

We are well aware that the moving of the armature of such a machine across the lines of the field of force is only an equivalent of moving a secondary coil nearer to, or further away from, a primary coil.

Since we cannot wholly get rid of the evil works of induction, we at least have the satisfaction of knowing that we can also utilize the same principle, and make it subservient to our necessities.

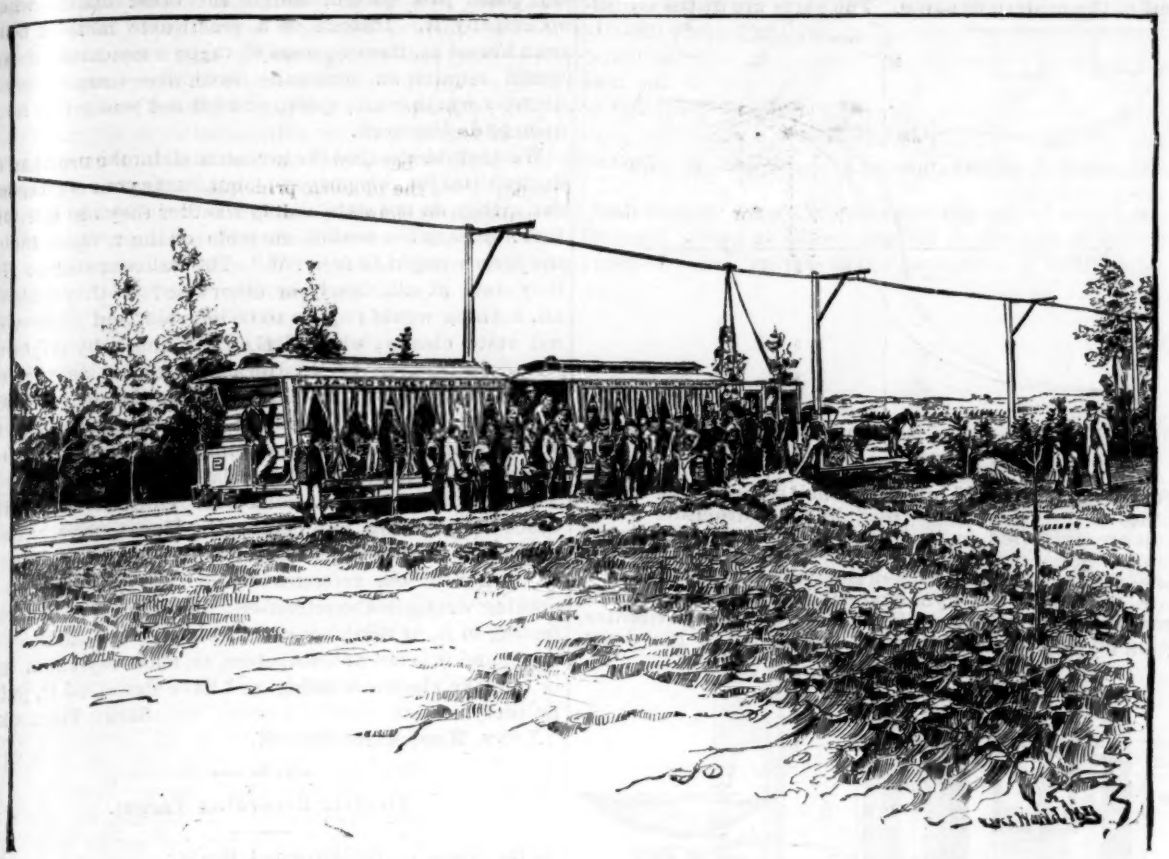


FIG. 1.—DAFT ELECTRIC RAILWAY, LOS ANGELES, CAL.—SINGLE WIRE.

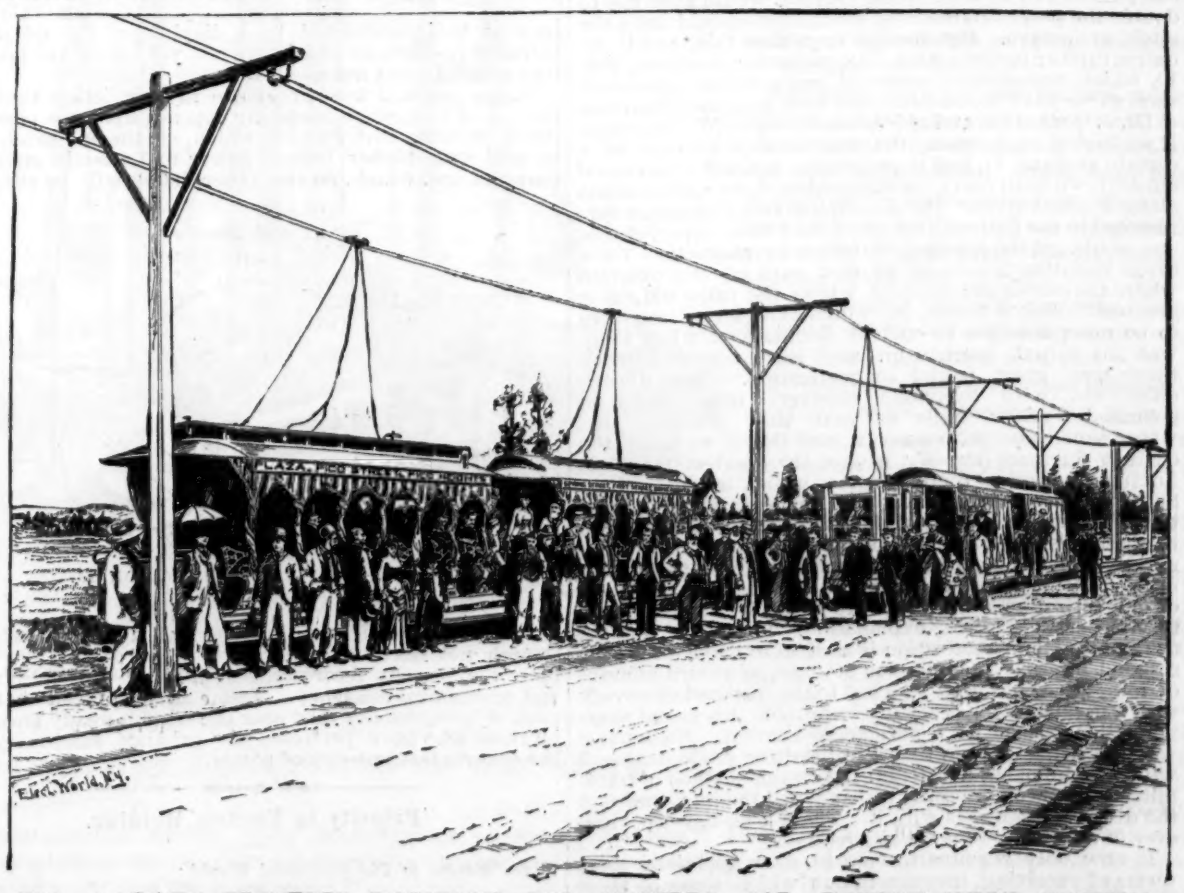


FIG. 2.—DAFT ELECTRIC RAILWAY, LOS ANGELES, CAL.—DOUBLE WIRE SECTION.

Electric Night Sight for Ordnance.

In the night sight recently brought out by Sir W. Armstrong & Company, at Elswick, an alignment is obtained which is easily discernable by the eye under all degrees of dusk or darkness; is capable of even more accurate adjustment than the usual day sight, and is so arranged that even on the darkest night in which fire is possible, the observer's eye is in no way fatigued or blinded by the illuminated points.

The sight is made in several forms according to the purpose for which it is applied. When used with the director for discharging guns from a central position or for the sighting positions in turrets or barbettes, light is transmitted by reflection from an electric lamp through two small spherical lenses where it concentrates in two minute and easily adjusted points of light. For the torpedo director used for discharging torpedoes and for direct use with larger guns, two lamps are employed, whilst for smaller guns such as Hotchkiss and other three-pounders and six-pounders, two separate sights, each with its lamp, take the place of the ordinary day sight.

As most warships are now fitted with the electric light the application of these sights is arranged in connection with the light circuit. A short length of wire with a terminal in a convenient position close to the gun or director enables the sights to be illuminated as desired. These sights are applicable for directing instruments for discharging guns and torpedoes either on board ship or in forts and coast batteries; for ordnance generally, afloat and ashore; and for position finders and observation mines.

The Los Angeles Electric Railway.

Los Angeles, California, the first city in the country to discard gas entirely for its street lighting, and to adopt the electric light in its stead, has now had in operation for two months an electric railway on the Daft system. The Los Angeles Electric Railway Company has working three miles of electric railway on Pico street, and is building two miles more to reach the Plaza. Four cars are now in operation, the power being transmitted by means of heavy copper wires suspended overhead. Our illustrations show the two methods employed, one having a single overhead conductor, with rail return, and the other a double conductor throughout. According to the Los Angeles *Illustrated Herald*, the road has not failed a single day since the start, and has carried in a single afternoon on three cars, a distance of three miles, fifteen hundred passengers. The speed of the road is usually from 10 to 12 miles per hour, as fast as is deemed safe for the streets of the city.

The secretary and general manager of the road, Col. C. H. Howland, is of the opinion that it is *time of transmission*, and not distance that increases the value of real estate. That is, if a horse car can convey passengers a distance of four miles in one hour, and electricity can convey the same in 20 to 30 minutes, it practically shortens the distance of the property from the centre of business, and the effect is evident.

Still Another Suggestion as to the Air Space.

To the Editor of The Electrical World:

SIR: Please allow me to suggest the word "passage" to designate the space between the armature and the field magnet in a dynamo. The air, the lines of force and the wire upon the armature use the indicated space as a passage.

GRANVILLE T. WOODS.

Telephonic Investigations.*

BY PROF. SILVANUS P. THOMPSON, D.SC.

(*Concluded from page* 166.)

But my attention has been more directed of late to the object of bringing to bear on the small scale the same general principles which have been found to hold good on the larger scale in the construction of dynamo-machines and motors. Given a circuit into which the transmitting apparatus has thrown fluctuations of electromotive force of a certain amplitude, the problem is to utilize in the receiver the largest amount of the electric energy. All the principles that come into play in the electric transmission of energy come in here, but with certain restrictions. For example, not only must a certain amount of electric energy be transformed into mechanical energy, in order to give the sound of the required loudness, but the mechanism must be such that the organ which emits the sounds, be it a tongue or a tympanum, or any other organ, must be capable of moving with large amplitudes or small, with rapid frequencies or slow, and must still in moving generate such counter-electromotive forces as shall make the work utilized a maximum. All such principles of construction as apply in dynamos to the avoidance of eddy-currents, of needless self-induction, of magnetic leakage, and the like, also apply to the receiving telephone. There is a conductor which carries a current, there is a magnetic field in which the conductor lies. Either the conductor, or else the field-magnet or some part of it, must move, and it is desired to make their mutual reaction as great as possible. If the coil is to move, it must be placed in the strongest possible field, and so placed that its minimum motion shall alter by a maximum amount the total magnetic induction through it. The iron or steel should be arranged so that the magnetic circuit which they form should be as nearly closed on itself as possible. By the light of dynamo principles it is simply absurd to construct a receiver in which one pole of the magnet is far away from the working parts. Furthermore, just as in every dynamo and motor, there is a gap or gaps in the magnetic circuit where the working coils are situated, so in telephonic receivers there are gaps in the magnetic circuits, and it is there that the working coils should be situated. Take any one of the modern improved receivers—those of Siemens, Gower, Ader, d'Arsonval, Uchorowicz—their magnetic circuit is all but closed, and the coils are *at* the gaps. It is there that their currents in passing through a given fluctuation will produce the greatest effect on the magnetism of the magnetic circuit, and therefore on the attraction between the two parts. The current must be brought to bear, so to speak, upon a loose joint in the magnetic circuit.

There is another matter in which our present knowledge is very imperfect. It is found that in every receiver (even the electrostatic ones too) there must be an initial force exerted upon the vibrating part, be it tongue or tympanum, or any other kind. A mere unexcited electro-magnet placed behind an iron diaphragm is practically useless to receive alternating currents from the secondary coil of a transformer. It does not speak out until its core has received an initial magnetism either from an initial current or from an auxiliary magnet, permanent or temporary. No doubt a portion of this effect is purely mechanical, for the same reason that an acoustic telephone does not speak properly unless the line between its two tympanums is taut. Moreover, as Mr. Giltay has shown, a non-polarized core, excited by an alternating current, would give rise to double the proper number of vibrations—would raise the pitch an octave. But there is more than this, and it requires further investigation. Consider the diagram, Fig. 10, which represents a cycle of magnetizing operations such as we have become familiar with from the researches of Dr. J. Hopkinson and of Professor Ewing. We know that if we first of all decrease the magnetizing current by a certain amount, δi, and then increase it again by an equal amount, we shall carry the magnetism down and up again along a small cycle. Three complete small cycles are represented in the figure. Now one would have expected that one would get the greatest variation in magnetism for a given variation of current at that part of the diagram where the curves are steepest, where the ratio $\delta M / \delta i$ is greatest. That is to say, one would expect the iron core to be most sensitive to current fluctuations when there was no initial magnetism, and least sensitive when there was great initial magnetization. But experience, not with telephone receivers only, but with polarized relays, tells us that this is not true where time comes into account, and that if we make the current fluctuate *rapidly*, we get the greatest magnetic fluctuations when there is some initial magnetization. Some experiments of mine now in progress go to show that the "sensitiveness" of the iron core increases with an increase of initial magnetization, at first slowly, then more rapidly, and has not attained a maximum even though the magnetization be pushed far beyond the bend of the curve of magnetization. But there are some obscure contradictory facts still requiring explanation. In view of the fact that an initial magnetization is needful to make a receiver respond properly, it appears to me that an absurd amount of importance has been attached to the disputed discovery that a permanent magnet might provide this initial magnetization instead of a permanent current. No doubt it was surprising to learn that a transmitter could transmit without employing a battery: but as this method of transmitting has been practically abandoned, the importance of the discovery vanishes with it. There is no novelty whatever in using a mere polarized receiver.

It now only remains for me to describe briefly three forms of receiving instruments in which some of these ideas are embodied. Examples of most of them are on the table, and they are illustrated by the remaining figures.

Fig. 11 shows a form of instrument named a "Spring" receiver. It is based upon the early form of C. and L. Wray, in which two electro-magnet cores attract one another, and so impart motion to a sounding-board. In my instrument the sounding-board is replaced by a flat spring P, of mica, ebonite or some non-magnetic metal, to which are attached the two working cores $C\,C$. These form part of the magnetic circuit of an external magnet $N\,S$, and the working coil E is placed over the gap in the magnetic circuit. Iron or steel, if used for the spring, would spoil the action, as it would short-circuit the magnetism. This receiver works extremely well on induction circuits. An important point in its design is that the centre of the spring, which will have the greatest amplitude of motion and is most active in imparting sound to the air, is not under a perpetual magnetic constraint like the central part of the iron diaphragm of the common telephone receiver.

Fig. 12 illustrates a form of receiver in which the magnet is a long, narrow triangle of steel, having the apex bent round and inserted in a circular cavity cut out in the base of the triangle. The south pole thus surrounds the north, and in the intervening gap lies the working coil. Instead of the usual iron plate held down all round there is a metal cup, or dish of metal, ebonite or celluloid, which can be held over the ear, and it is held up at its centre by being riveted by a stout iron rivet to a short triangular steel spring. This instrument, even in a crude form, is excellent both as receiver and transmitter.

Figs. 13 and 14 relate to a form of instrument which I have ventured to term a "*Dynamo-telephone*," inasmuch as the action of these instruments is directly taken from that of the modern dynamo. The parts are distinctly differentiated into a field-magnet, which stands still and furnishes an intense magnetic field, and an armature whose coils are traversed by the working currents. The main point of difference is that, whereas in the dynamo-electric machine, whether used as generator or as motor, the armature rotates, in the dynamo-telephone, whether used as transmitter or receiver, the armature merely vibrates, being pivoted elastically. It is represented in the drawings as being connected to a diaphragm D. Of other forms of instrument which are not yet out of the laboratory stage, I must not speak.

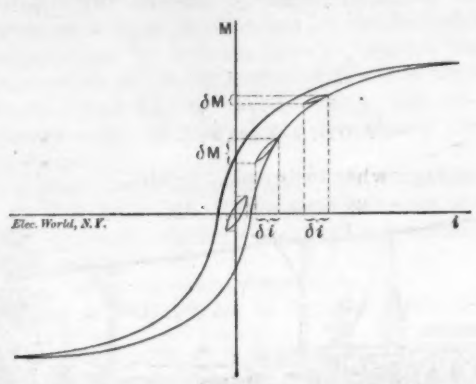


FIG. 10.

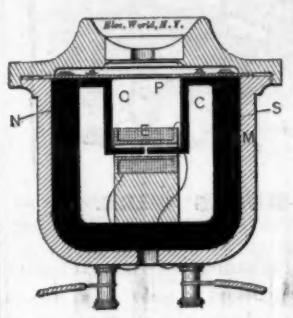


FIG. 11.

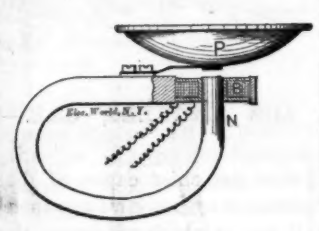


FIG. 12.

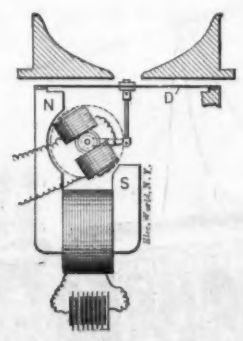


FIG. 13.

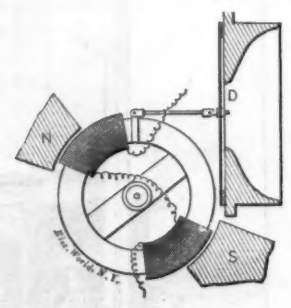


FIG. 14.

In conclusion, I would reiterate my conviction that the success of long-range telephony depends upon the possibility of devising instruments, which, on the one hand, can be used with higher battery power to transmit stronger currents, and which, on the other hand, will be adapted to receive these currents by means of apparatus which, though not necessarily more sensitive to small currents than the present receivers, will have a higher electrical and mechanical efficiency. And I am convinced that the path of progress lies very near the road already traveled by those who have perfected the existing machinery for the electric transmission of power.

* Read before the Society of Telegraph Engineers and Electricians, Feb. 27, 1887.

Priority in Electric Welding.

To the Editor of The Electrical World:

SIR: In your issue of March 26th a letter from Mr. Carl Hering appears, in which he refers to the provisional specification of Morris, Weare and Monckton (English patents, 1862), and makes a quotation therefrom, in which he professes to find an anticipation of the first claim of my patent, 347,140, on electric welding. I have no need to rewrite the extract which he gives, and it is for his purpose, presumably, the best to be found in the provisional specification referred to. He thinks that there is something wrong somewhere, and says it is certainly not in the reference, and asks if this reference does not make my claim referred to void, and the art of electric welding public property.

Now I have neither the time nor the inclination to enter into a discussion, as to what an invention is, nor what a disclosure of an invention is, with Mr. Hering or with any one else, and I therefore must content myself with quoting my claim first, which for him seems to be an indigestible morsel. It is "The herein-described art of effecting union between two pieces of metal, consisting in holding the same in contact at the point of union and simultaneously passing a current through the joint of a power to fuse and unite the pieces, as and for the purpose described."

I have not read the provisional specification of Morris, Weare and Monckton, but from the extract Mr. Hering furnishes there is nothing to tell how it was proposed to work, and I fail to see or find in the extract anything which describes the art of electric welding as set forth in my claim just quoted, and in the other claims which accompany it. Instead of a practicable method being even hinted at, there appears so vague a statement that it would require an unusually inventive imagination to discover whether arc, spark, or what not was to be relied upon to do the work.

We are told also that the inventors claim the use of an induction coil for this purpose, "but," says your correspondent, "they do not state *clearly* whether they use it to convert *high* into *low* tension currents or the reverse, *though* the *former might be inferred*." The italics are mine. Did they state at all, clearly or otherwise? If they stated at all, nothing would require to be inferred, and if they did not state clearly, why did they not, and why *might* the *former* be *inferred* by Mr. Hering, especially as the ends of wires can be readily melted down by the arc produced by the fine wire of an induction coil whose primary is fed with low tension currents, and may even be rudely stuck together after the arc discharge has melted them?

After criticising the action of the United States Patent Office in granting my claim, Mr. Hering says, "There appears to be something wrong somewhere, and it is certainly not in the reference." No, Mr. Hering, there is nothing wrong in the reference; the wrong is only in your finding in it, or thinking you find in it, more than it contains, and it is not apt, therefore, to make my claim void, or to make electric welding, as I have described it, public property.

ELIHU THOMSON.

LYNN, Mass, March 28, 1887.

Electric Recording Target.

To the Editor of The Electrical World:

SIR: In your valued issue of 5th inst., I notice a reference to the novel (?) invention of "An Automatic Target Indicator," which is substantially similar to my English patent of May 16, 1861, No. 1,246; also to my *improved* target (*vide* inclosed circular), to which was awarded a competitive medal at the London International Exhibition of 1862, and which was afterward transferred to the Crystal Palace rifle range at Sydenham. It there obtained the following certificate:

I certify that Gisborne's improved "electro-graphic" target has been in constant use at this range for the last three months, during which time over *sixty thousand* shots have been fired at it and that it has *never failed to record correctly every hit made*." Signed. F. PETERS.
Manager C. P. Rifle Range.

Before succeeding in *perfecting* the target referred to, I expended much time and over $7,500; but the cost of manufacturing the apparatus was too great to commend its general adoption by the military authorities and the public.

My chief difficulty was in providing an electrical contact which could *at all times* be depended upon, despite the extraordinary vibrations which caused the pendant balls from chains, pendulums, eccentric rubbing contacts, single and double springs, mercury cups, etc., etc., to be unreliable when acted upon by the sharp concussion of a rifle ball upon a metallic plate. Such difficulty was finally overcome, *in toto*, by my device of a loose ball in an inclined ebonite tube, in which was a hinged lever contact-maker (acting like a mouse-trap fall), the weight of the ball at rest tilting the lever, and thus breaking contact, or closing the circuit *firmly* during the *time* that the ball was propelled up the tube and returned to rest against the target. I simply send you the foregoing particulars for the guidance of experimenters in electric recording targets, and as a matter of interest (my patents having expired). I may add that my invention was sustained in the highest law courts of England, "as the only *effective* and *reliable* electric recording target then invented."

F. N. GISBORNE, C. E. and Electrician.

OTTAWA, Can., March 16.

One More Answer to "F. S."

To the Editor of The Electrical World:

SIR: I have observed no answer to an inquiry by F. S. in your paper regarding the E. M. F. of a dynamo. He obtains the value $E_a = 2\,Z_1\,n\,N\,t\,10^{-6}$, which is twice the value generally accepted.

The error in the calculation of F. S. consists in ignoring the fact that the two halves of the armature are connected up in parallel circuit, so that the E. M. F. is due to only half the windings of the armature. F. E. N.

WASHINGTON UNIVERSITY, ST. LOUIS, Mo.

Studying Earthquakes by Electricity.

(*Concluded from page* 166.)

Prof. Rossi's microseismograph (Fig. 18) is a derivation from his protoseismograph, and, as its name indicates, is intended for the registering of extremely minute disturbances. It does not, however, indicate the character or direction of these disturbances. The masonry foundation pedestal and base framework are the same as in the protoseismograph. The central pendulum weight *P*, supported by a copper wire, is also the same as before. The wrought-iron cross resting on the crowning circle is made with longer arms, which extend outward to a considerable distance. At the end of each arm (Fig. 18) is a brass tube *b c d e* similar to the central tube, and provided like the latter with a screw *v' v'' v'''* that forms the point of suspension for a weight attached to a fine copper wire. These four weights are exactly identical with the central weight, but the length of the suspending wire is different for each. Thus the tube *b* is five cm. shorter than the central tube, but is longer than the tube *c* by the same difference, while the tube *d* is five cm. less in length than the tube *c*, but five cm. more than the tube *e*. Therefore, while the weights are all suspended at the same distance from the base of the apparatus, yet owing to these differences in the length of the tubes above, their supporting wires are all of different lengths. The central weight, which has the longest wire, forms a pendulum whose length to its centre of gravity is 99 cm. Of the four outer weights, that corresponding to the brass tube *b* has the longest wire and forms a pendulum of 94 cm., while that of *e* has the shortest, making a pendulum of 79 cm., those of *c d* being 89 and 84 cm. respectively. There are four mercury cups, as in the preceding apparatus, and the contact points likewise consist of the same delicate platinum needles suspended on single silk filaments. In the figure the platinum contact points are shown replaced by pointed weights, because the fine platinum points would not be so plainly visible. Each silk fibre has one end attached to the central wire and the other to the wire of one of the outer weights. The distance of the outer weights from the centre is such that the platinum needle is suspended exactly midway on the silk fibre. As in the previous case, the springs attached to the contact needles serve merely for the purpose of electrical connection and are made very light. The columns upholding these springs are insulated as before from the mercury cup. Fig. 19 is the diagram of connections and shows that these four columns are all connected together electrically and to a line connecting with one of the electro-magnets of the registering clock, the four mercury cups being all connected together and to the return wire as before. Now, bearing in mind the fact that all five of the weight pendula have different periods of oscillation, it will be easy to understand how they will act to amplify any vibration communicated to the apparatus. The vibration, however slight it may be, starts a minute oscillation of the pendula. At first they start and move together, but the shorter pendula will soon gain upon the centre one, and they will reach a period of relatively contrary movement in their oscillations. Whenever this relative opposition of oscillation takes place between any one of the shorter pendula and the centre one, the contact needle corresponding to this pair will be alternately moved up and down. This motion will be amplified twice as much as in the protoseismograph, for the evident reason that the dip of the contact needle will result from the movement of *both* pendula toward each other, instead of from one pendulum moving relatively to a stationary column. In this way the occurrence of the most minute vibration will be indicated by one or more dots on the paper strips, according to the intensity of the shock and the number of pendula set in motion. Of the eight registering pens contained in the registering clock, four are operated by the protoseismograph, while one is connected with the microseismograph. This leaves three to spare. Of these, one is usually connected with the apparatus for subsultory impulses, described in a previous article (Fig. 6). The other two may be used in connection with other forms of meteorological apparatus.

The seismological instruments which have been described are all in use by the Italian Meteorological Office. The simpler forms are more extensively employed; but at points where the "material" for study is more abundant, the more complicated forms are used. In the vicinity of Mount Etna there are "earthquake" stations which are not only equipped with all these instruments, but also with every apparatus which might be of service for the observation and record of other concomitant natural phenomena. The comparatively great simplicity of these

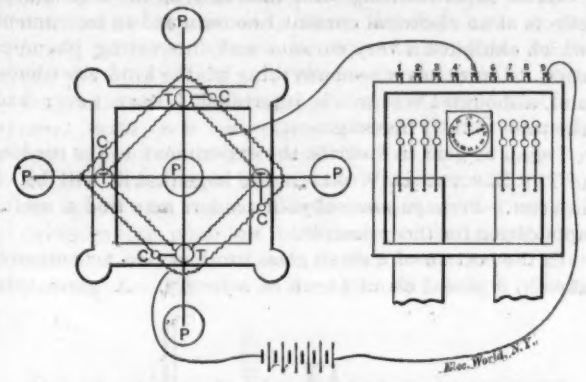


FIG. 19.—STUDYING EARTHQUAKES BY ELECTRICITY.

instruments, when their extreme delicacy of action is considered, shows no little ingenuity on the part of those who created them, but it is at the same time a testimonial to the incalculable services which electricity can render in thus assuming the most difficult parts of a task and making the work seem like mere play.

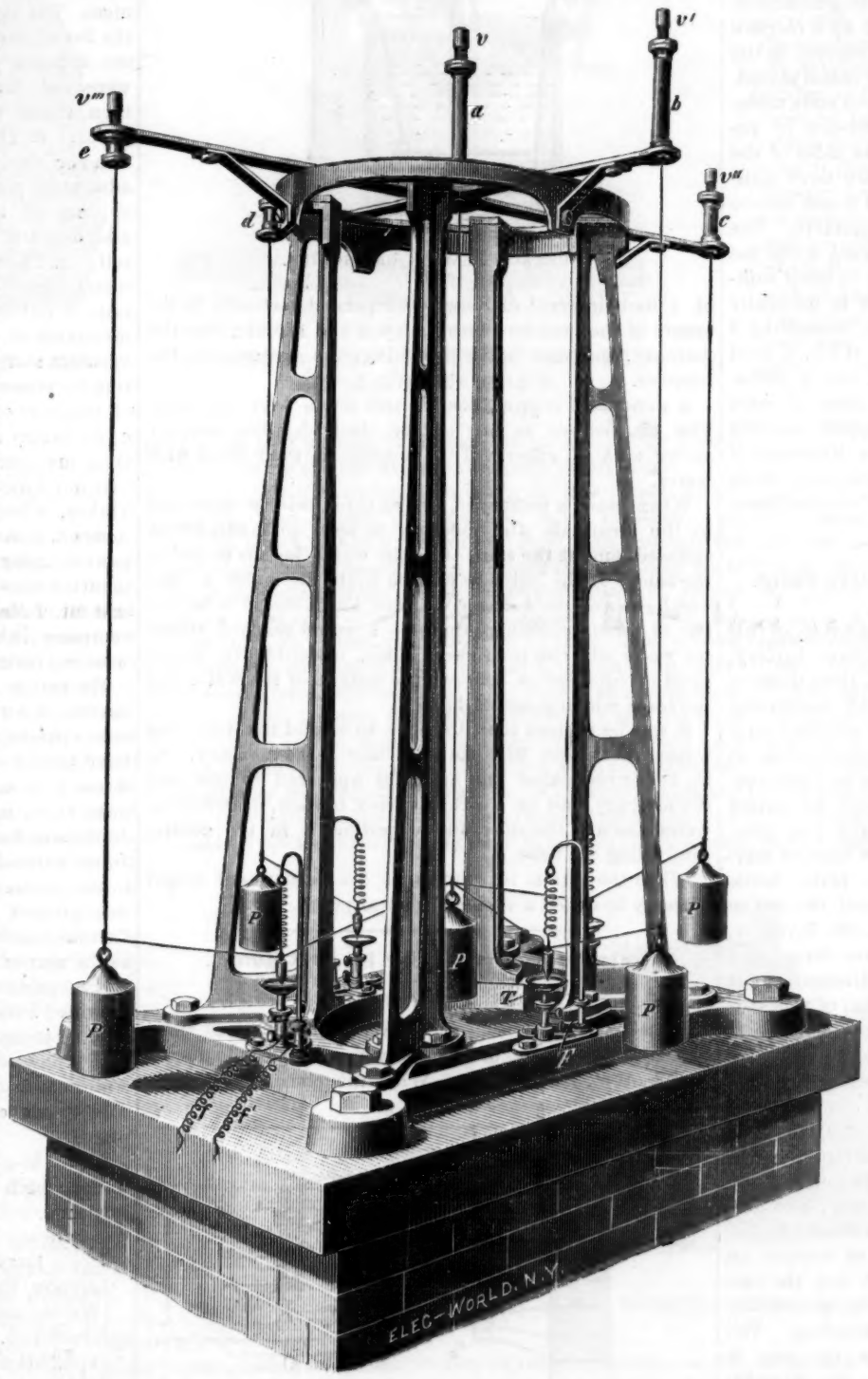


FIG. 18.—STUDYING EARTHQUAKES BY ELECTRICITY.

Proportioning Conductors to Current.

To the Editor of The Electrical World:

SIR: I have just read a notice in the London *Electrician*, of the 18th ult., of Messrs. Martin and Wetzler's *Electric Motor and its Applications.*

In his remarks on my tentative method of proportioning conductors to their current, the reviewer is at a disadvantage, since the part of my discussion which appears in the book of necessity omits certain prefatory description which would account for seeming omission and inconsistency.

The specification of an electrical power-plant, which, it is not out of place to say, was *not* framed by native "American genius," was referred to me for examination with respect to its size, adapted to avoid prejudicial heating, which was thought to be excessive. This was the entire scope of the investigation. The stated limits were imposed and I was not at liberty to "assume" anything or do more than consider the specific point upon which my opinion was asked. A dim consciousness of my innate disability probably influenced me to leave the designing of a uniform conductor of equal potential throughout to those who by birthright were more at home in the "arid atmosphere of theoretical discussion." After my stating emphatically that the rate of radiation from a conductor in the given circumstances was an unknowable quantity, the *rate* of heating became a useless factor in the calculation, and dropping the quantity *t* in Clark and Sabine's formula hardly called for the exclamation point which the receiver has accorded it. The effect is analogous to changing the notation of an algebraic expression for current from coulombs to ampères, which he is probably able to define.

As for Professor Forbes' experiment, it is undeniable that if his wire were small enough and his current heavy enough, there is no reason why he should not have obtained a temperature of 50 degrees Fahr., or even more, but how this applies to the case under discussion it is not easy to see.

"The English reader" may not be aware that long and painstaking experiments by Professor Anthony, of Cornell University, have revealed such anomalies as that under some conditions bare wires heat more rapidly—or conversely radiation is less from them—than covered ones; also that of two similar wires under the same current, but covered with different thicknesses of non-conducting material, the radiation is greater, and, therefore, the rate of heating slower—from the thicker covered of the two. These results are confirmed by the observations of the Edison Electric Light Company and others.

The proportions which my method verified almost exactly agree with Professor Fleeming Jenkin's mean limit of safe current, viz., 800 ampères per square inch of conductor.

Enough algebra has drifted to this side of the Atlantic to enable even "misleading American electricians" to comprehend that while a current in a conductor, considered as a static charge, is uniform at every point, yet its rate of performing work at any point is directly proportional to the potential there, which in turn bears a ratio to the resistance between the point and the origin of current.

Experience does not yet indicate where this property begins to make itself felt prejudicially. In railway conductors of over four miles circuit, which have been in daily use for eighteen months, the difference of potential at the remote point is practically inappreciable in the regular working of the line.

A knowledge of such instances might tend to modify—if anything could—the rather ha-ha tone of the reviewer.

A modern English electrician gives some excellent advice respecting the habit of reasoning by means of mathematical expressions, which is very apropos. Speaking of Ohm's laws, he says: "Invaluable in dealing with the mode of operation, they only delude us if we regard them as facts and do not clearly trace out the reasons why they are valuable. The importance of these considerations will be evident if we clearly see that in consequence of misunderstanding this, and by converting mathematical formulæ, which are nothing but mental tools (apparatus for mechanical thinking in some sense), into actual facts and theories, electricians have actually been led into great errors as to the values of the electric constants." Also, "the very first point as to which a clear understanding is necessary, is whether these symbols have any realities behind them. Do they represent facts, and if so, what facts, or are they mathematical expressions, simple tools of thought? If the latter, we must carefully avoid the error of mistaking them for facts, lest, like the monster Frankenstein, they prove too much for their creators."

THOMAS WHITESIDE RAE.

B. & O. Operations.—A dispatch of April 1, from Baltimore, says: The Baltimore & Ohio Telegraph Company has signed a contract with the French Cable Company for an exclusive interchange of business. It does not abrogate the relations between the Baltimore & Ohio and the Mackay Commercial Cable. The officers of the company announce that they will extend their lines aggressively into all competitive territory. They say that the company is making money, while the earnings of the Western Union are constantly decreasing. They now have 64,000 miles of line, or 125,000 miles of actual wire.

Conversion of Heat into Electrical Energy Direct.

Messrs. Hinghausen and Nerust have recently described in *Wiedemann's Annalen* a phenomenon of very considerable interest, one which, in fact, amounts to a new method of obtaining an electric current by the direct conversion of heat. In some respects this new discovery resembles the effect which was first observed by Hall a few years since. Hall's experiment was the following: If a narrow slip of gold leaf be traversed by a current from end to end, and if a delicate galvanometer be connected to two opposite points on either side of the slip, it is obvious that these points being at the same potential no current will traverse the galvanometer. But if a magnetic field be now established so that the lines of force pass through the gold leaf in a direction perpendicular to the plane of the latter, then it is found that the points diametrically opposite upon the sides of the slip are no longer at equal potential, and the galvanometer is now traversed by a current whose value proves to be different for different metals. Various suggestions have been made as to the cause of this remarkable result, but no explanation seems as yet to have been definitely agreed upon. This being understood, the discovery now made in Vienna can be explained in very few words. If the current of electricity which traverses the slip longitudinally be removed altogether, it may be replaced by a *thermal* current, and we shall still get an electric current in the galvanometer. That is to say, if a thin slip of metal placed, as described, in a magnetic field have its two ends maintained at different temperatures, then a difference of potential is set up between the two opposite sides of the metal slip. The experimenters state that they have satisfied themselves that the current so produced is not due to any thermo-electric action between the contacts. The fact that the direction of the current is reversed when the direction of the magnetic field is reversed is in itself sufficient to remove this objection. The effect is naturally very minute; with a square plate of bismuth, measuring 5 centimetres on each side, and 2 millimetres thick, a field of force represented by 5,000 C. G. S. units, and a difference of temperature caused by placing a plate of mica against two sides of the bismuth, one dipping in cold water and the other heated by a gas flame, a difference of potential amounting to 0.00125 volts was observed. With iron instead of bismuth the current is in the reverse direction.

A Storage Battery of High Electromotive Force.

In a patent recently issued to Mr. A. V. Meserole, of this city, the inventor describes a form of storage battery, which he claims to possess a higher E. M. F. than those in use generally. The battery is constructed by immersing plates of zinc and lead in a cell containing a mercury solution, such as sulphate of mercury, a zinc solution, such as sulphate of zinc, and free sulphuric acid, the lead plate being preferably amalgamated. If a current be passed through this cell from the lead (negative) to the zinc (positive) plate, a porous and highly absorptive layer of mercury and zinc will be formed on the positive plate, while at the same time the negative plate is oxidized, the cell so prepared yielding in discharge, according to the inventor, a current of nearly three volts electromotive force, and maintaining its charge without material diminution for very considerable lengths of time. The action of this battery he conceives to be, in its principal outline, as follows:

During charge, zinc and mercury are deposited on the positive plate, hydrogen at the same time being included in that deposit, and peroxide of lead formed on the negative plate. If mercury is present on the negative plate, which is, as above stated, thought to be desirable, it will serve to replenish the solution, preventing the bath from being partially or wholly depleted of mercury, and promoting regular action. In discharge, the occluded hydrogen to some extent unites with the excess of oxygen on the negative plate, as in the Planté battery; but the current of discharge the inventor believes to be principally due to the following more complex reaction. The deposit of zinc and mercury breaks up and is redissolved, the zinc, by reason of its superior affinity, displacing the mercury in a part of the molecules of mercury sulphate. This displaced mercury in turn displaces hydrogen in the free sulphuric acid, which in turn draws off the oxygen of the peroxidized negative plate. A part of the mercury set free is also, probably, thrown upon the negative plate in the form of an oxide. The electromotive force of the cell should therefore be equal to that developed by the zinc replacing the mercury in the mercury sulphate supplemented by that developed by the liberated mercury in replacing hydrogen in the dilute sulphuric acid, and by the displaced hydrogen in uniting with the oxygen of the peroxide.

When the cell is in perfect condition, no hydrogen is given off either in charge or discharge, from which Mr. Meserole infers that its liberation is prevented, or that it is fixed or occluded in large quantities, or both in part, of which the last seems to him to be the most reasonable hypothesis.

A Terror to Burglars.—Mrs. Hicks-Lord has obtained permission to put an electric light in front of her house in Washington Square, as a protection against burglars.

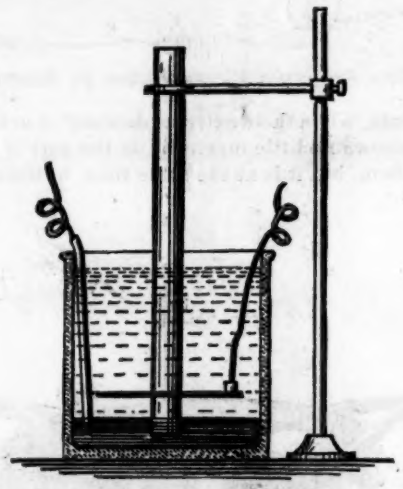
Surface Tension of Liquids Under the Influence of the Electric Current.

BY EDWARD BLAKENEY.

While experimenting some time ago on the mechanical effects of an electrical current I constructed an instrument which exhibited a very curious and interesting phenomenon. I have never seen anything of the kind elsewhere, and, although I was much interested, I have never had the time to fully investigate it.

I shall be glad to describe the experiment to the readers of THE ELECTRICAL WORLD in the hope that it will be of interest. Perhaps some of your readers may find a useful application for the principle.

In the bottom of a small glass tumbler (see accompanysketch) is placed about ¼ inch of mercury. A glass tube



SURFACE TENSION OF LIQUIDS.

of ¼ inch internal diameter is suspended vertically in the centre of the tumbler, with its lower end dipping into the mercury, but not quite touching the bottom of the tumbler.

A punctured copper disc is slid down over the tube. This disc serves as one of the electrodes, the mercury serves as the other. The tumbler is then filled with water.

When, now, a battery of two or three cells is connected to the terminals, the mercury is seen to be somewhat agitated, and at the same time the water begins to rise in the tube. If the latter be not too high the water at last overflows and the action continues, but if the tube be over two or three inches high there is a point reached where the water will rise no higher. This, undoubtedly, is the point of equilibrium between the weight of the water and the force which is acting upon it.

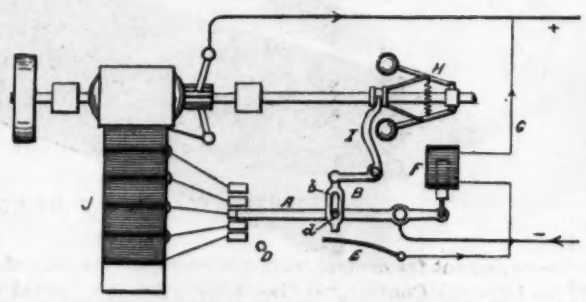
It will be noticed that, in order to ascend the tube, the water must first find its way under the mercury. So far as I investigated the matter it appeared to me that the mercury took on a sort of vortex motion, drawing the water down at the sides and expelling it in the centre, thus filling the tube.

When the action is continuous, the instrument might properly be called a vortex electrical pump.

Centrifugal Governor for Electric Motors.

BY R. M. HUNTER.

In the issue of THE ELECTRICAL WORLD of March 26, there appears a description of an improvement in electric motors by Mr. Wm. Hochhausen. With the construction there



CENTRIFUGAL GOVERNOR FOR MOTORS.

shown, it seems to me that the speed will fluctuate between certain limits and the governor will not be properly effective except for a given load. I do not mean to say that a governor acting by centrifugal force cannot be made to do the work, but as I understand the construction of the Hochhausen governor, it is not operative except for a given predetermined load. It may be sensitive in its action, but its momentary action is not continuous or constant until another change of load takes place. I suggest the following construction to overcome this defect. The governor *H*, in the accompanying diagram, being set for a given load at a given speed, if the load decreases, the speed will increase and the governor *H* will pull the lever *I* which will lift the slotted link *B*. The pin *d* of the switch lever *A* will be lifted by the link until the proper number of coils *J* of the field magnets are cut out to reduce its speed. Upon the reduction taking place the lever *I* oscillates in the opposite direction and the link *B* descends, but leaving the lever *A* in its raised position, the slot *b* playing over the pin *a* without disturbing the lever *A*. The speed will now remain constant and normal with the reduced load.

If now the load should be increased, the speed would diminish, the governor would push down link *B* and close the local shunt circuit *G* through contact spring *E*. A helix *F* in said circuit instantly draws in its core and forces the lever *A* back to its original position against stop *D*, for maximum load at normal speed. If the increased load is not a maximum, the governor will act to cut out the helix *F* and instantly reset the lever *A* for the new load. This device would act quicky and absolutely and I think it is perfectly novel.

Method of Making Battery Plates—Lithanode.

To the Editor of The Electrical World:

SIR: My attention has been called to an article headed "New Method of Making Battery Plates," in your issue of March 5. In this article I find one of my processes for making *lithanode* plates (patented by me in this country under date of April 15, 1885, No. 4,671) referred to as the invention of Messrs W. H. Tasker and T. J. Jones, of London. Every essential point of my invention, and not merely the few unimportant and unpatentable variations made by them in my process, is ascribed to these gentlemen. The variations in question are: 1. One addition to the list of the inert materials which might be mixed with the litharge in the manufacture of the plates if it were not for the fact that these materials have all been found to be detrimental rather than advantageous. 2. The admixture with the litharge, in substitution for the inert "kieselguhr," of peroxide of lead—an admixture previously patented, and which is as detrimental as that of the inert material, unless the "peroxide" added be the "lithanode" invented and patented by myself. 3. The use of a spray of glycerine and water, as to which I prefer for the present to say nothing. All the details of any substantial importance, such as the use of monoxide of lead, its incorporation while in a dry pulverulent state with sulphate of ammonia, the consolidation by pressure and steaming, the half-saturated solution of sulphate of ammonia and the "browning" by means of an earthy (or alkaline) hypochlorite, are simply taken from my specification or from the description of my invention which I gave in confidence to Messrs. Jones and Tasker, when the manufacture of the plates was commenced, some time after I had taken out provisional protection under the date and number given above. I may mention that Mr. Jones is one of the managing directors, and Mr. Tasker is at present manager of the works of the company to which, by agreement, I assigned the right of working certain of my inventions.

The article in question certainly has the appearance of a barefaced attempt to appropriate the credit of another man's invention; but I am bound to assume that it may have been due to a mistake, on the part of the person who wrote it, as to the scope of a patent, subsequent to that of mine above mentioned, which was taken out by Messrs. Jones and Tasker on the strength of my having, at Mr. Jones' earnest solicitation, omitted all mention of *steaming* in the claims appended to my final specification, although this process was described in the specification itself. Certain reasons for this omission were urged upon me, and as the matter did not appear to me of importance—since I had no particular wish to claim "steaming" generally, provided I was at liberty to steam plates manufactured according to my own invention—I conceded the point. A little knowledge of patent law, and more particularly of American patent law, would, I think, have prevented the subsequent expenditure on patents for steaming my plates.

I shall be glad of an explanation of the circumstances under which the article in question made its appearance in your columns, and I am ready, if necessary, to substantiate any statement I have made in this letter.

DESMOND G. FITZ GERALD, M. S. Tel. E. AND E.

LONDON, Eng.

[We are not in the habit of thus stating the sources of our information. In reply to Mr. Fitz Gerald's request for an "explanation" regarding the origin of the article he refers to, we would, however, say that our information was based solely upon a U. S. patent issued to Messrs. Tasker and Jones, No. 357,642 of Feb. 15, 1887. The article is ours.—EDS. E. W.]

In "The Swim."

To the Editor of The Electrical World:

SIR: In your issue dated March 19, 1887, there is an item referring to the "space between the iron of the armature and the field magnets in the dynamo." Permit me to suggest "the swim" as a suitable designation for the space referred to.

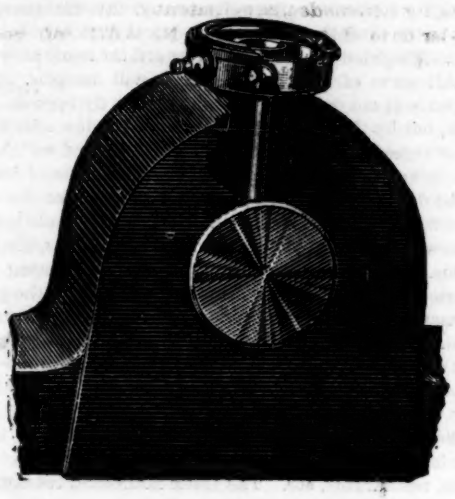
JOHN MCHUGHES.

BROOKLYN.

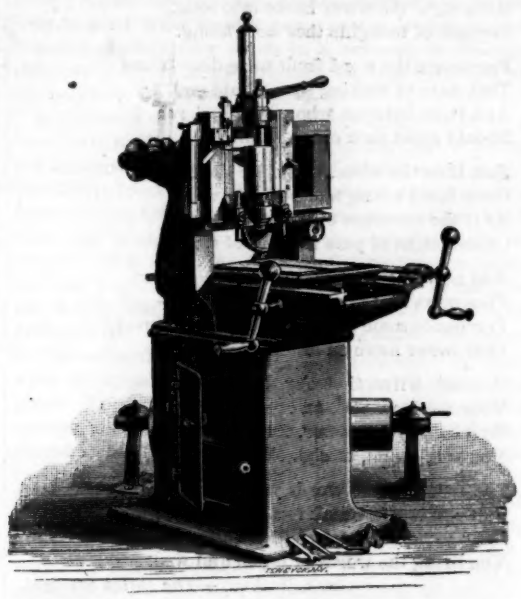
The Stage Snow Storm.—The use of electric lights in the theatres has driven paper snow largely off the stage. Various substitutes have been tried in Paris, and the very best imitation of snow has been found to be the scraps and clippings of kid left over from cutting out gloves. They float in the air, descending with a very realistic slowness, and they cling visibly to the garments of the actors. These clippings are furnished by several of the leading glove houses of Paris, and cost $2 a sack.

Profiler and Vertical Spindle Milling Machine.

With the variety of electrical work done at present a machine capable of performing a number of operations is desirable. To meet this end, Messrs. E. E. Garvin & Co., of this city, have designed the profiler and vertical spindle milling machine shown in the accompanying engraving. The table and traversing slide carrying the spindle are each moved by the ball handles shown, and the combination of the two movements makes it possible to follow any irregular outline. The operator has perfect control of the cutter, while the work is always in plain sight. The machine can be employed in spotting off and facing work, die sinking, key seating, edge milling, milling plain or T slots, cutting cam grooves on cylinders and also on a large variety of brass work. For facing off, this style of milling gives a perfect surface, and when the finished spots are on different levels, the spindle slide can be accurately raised or lowered by the lever, and positioned by a notch which has a screw adjustment.



ELECTRIC HOT JOURNAL INDICATOR.



PROFILER AND VERTICLE SPINDLE DRILLING MACHINE.

Electric Hot Journal Indicator.

All engineers and mechanics are aware of the annoyance and danger arising from the heating of journal bearings. Not only is the danger from fire to be considered, but in the case, for instance, of electric light stations, a stoppage of machines and extinguishing of lights means a heavy loss in rebates. It is, therefore, evident that a simple means of indicating the occurrence of undue heat on a bearing before it has reached a dangerous point is of considerable value. This has been recognized by the American Automatic Fire-Alarm Association, of Boston, who have devised a simple arrangement in the shape of a thermostat for indicating an overheated journal bearing.

The accompanying illustration shows the thermostat attached to a bearing. It consists of a Bourdon spring, which is brazed to the tube that fits into the hole bored in the cap of the bearing. Being in direct contact with the metal of the cap, the heat readily reaches the spring. The latter then expands and makes a sliding contact with an adjustable screw, thus closing an electric circuit and sounding an alarm.

The indicator is inclosed in a dust proof case so that all dust and grease is excluded.

The Growth of the Storage Battery Industry.

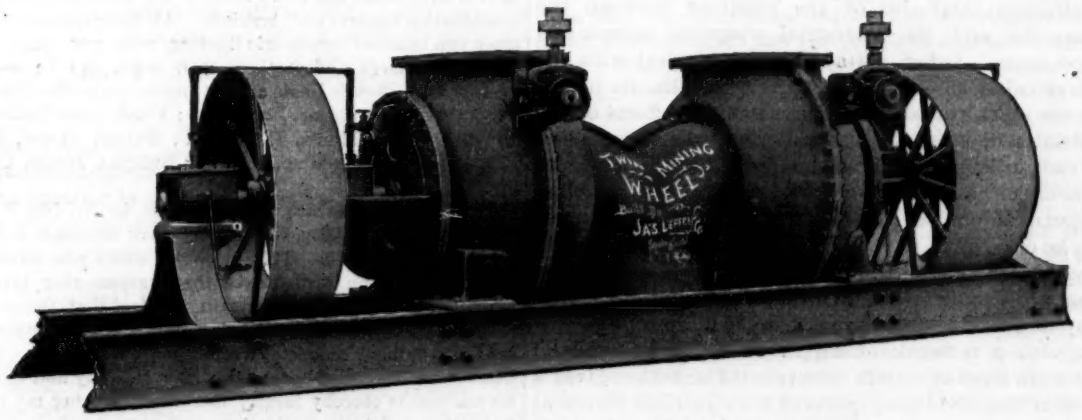
Striking evidence of the growth of the storage battery business is to be found in the annual report of the Electrical Power Storage Company (Limited) of England. It states that the profit arrived at by the result of the working of the year and by certain interests becoming marketable is £35,937 11s. 3d.; the balance of profit and loss of 1885 amounted to £22,412 6s. 9d., which, being deducted from the above profit, leaves a balance of £13,525 4s. 6d. to the credit of profit and loss, which the directors propose to carry forward. The shareholders will doubtless consider that the result of the operations of the past year is eminently satisfactory. The business of the company has increased, and a further great extension may be expected, if the Electric Lighting Act is amended, as proposed in the Bill now before the House of Lords. The works have during the year been fully engaged in the manufacture of accumulators and sundry electrical apparatus, and in addition to cells of the lighting type, motive power batteries for electric launches, torpedo, and tramcar purposes have been successfully constructed. The greater part of these are in use in England, and have been supplied principally through the medium of electrical lighting companies and firms, with all of whom the company endeavors to maintain a friendly alliance. Few installations are now erected in which the Electrical Power Storage batteries do not play an important part. The motive power cells have been chiefly used in connection with electric launches. Among the notable incidents of the year 1886 are the channel trip of the electric boat "Volta," and the public trials of the submarine boat "Nautilus," in both of which this company's accumulators were employed. The experience gained with these and other launches would indicate that electrical navigation must, at an early date, develop into a prominent industry. There is little doubt that in time the Admiralty will use electrical launches as part of the indispensable fittings of men-of-war, which are now, with few exceptions, being fitted throughout with apparatus which is suitable for charging accumulators. These might be used for regulating and supplying the light in the vessel while the launch is hanging on the davits, which plan has been successfully adopted in the case of the launch supplied to the steam yacht "Northumbria," for His Grace the Duke of Bedford. Many of Her Majesty's ships have been fitted with accumulators for working the light in conjunction with dynamos. More headway has, however, been made in this respect by the Danish and Italian governments, more especially the latter, which was in a position to determine precisely the merits of storage batteries for ship use from the trial made with the cells placed on the "Giovanni Bausan," nearly three years ago. The experiments conducted during the past three and a half years in train lighting have proved thoroughly successful, as the Railway Electrical Contractors (Limited) have received orders for largely extended business on the London, Brighton and South Coast Railway and other of the leading lines, and in consequence have commissioned the company to manufacture a considerable number of train lighting batteries. As regards foreign and colonial work, the directors have to report that a large contract for 100 tons of accumulators, to be used in the extensive arrangement for central station lighting in Vienna, which the Imperial Continental Gas Association is undertaking, has been fulfilled. The German Edison Company also use the company's batteries in connection with their lighting stations in Berlin. Many mills and warehouses on the Continent have adopted the batteries, and the trade houses through whom these were supplied express themselves highly satisfied with the results obtained. Several colonial governments are using the company's apparatus, and the users in the colonies are gradually becoming aware of the advantages of storage batteries. In the home trade a substantial increase in the demand for the several types of cells is anticipated during the current year, as it is now a recognized fact among engineers that no electric light installation is complete without storage batteries, and much attention is at last being given to the running of electrically propelled tramcars, which must increase the accumulator business in this direction. The Folkestone Exhibition lighting, which was entirely carried out by this company, ran without the slightest interruption, giving great satisfaction to the authorities. Many city offices have been lighted, among which may be mentioned those of the North British & Mercantile Insurance Company, English Bank, of Rio de Janeiro; Union Bank, of Australia; London and Brazilian Bank, the Leathersellers' Company, also numerous private residences. The lighting of the Prudential Assurance Company's offices with a plant suitable for 2,000 lamps was successfully accomplished in June last. The staff is now busily engaged upon several new installations. The plant for temporary lighting of evening parties and balls has been increased to meet the demand for this class of lighting. In the United States the Electrical Accumulator Company (in whose success this company is greatly interested), has, under the able management of its President, Mr. Theo. N. Vail, made rapid progress. In addition to Elwell-Parker (Limited) the company has granted a license to manufacture under royalty, for certain specified purposes, to the Edison and Swan United Electric Light Company (Limited). The directors have appointed Mr. Frank King, who has made a special study for several years past of secondary batteries and their use in central station lighting, to the post of superintending engineer.

The Telephone in India.

Mr. Killingworth Hedges, writing to *Industries* upon this subject, says that the telephone has proved a great success in India, although the early days of the industry were not "plain sailing," the Government having opposed the erection of telephone lines, whilst it still interferes with the development of telephonic communication on grounds similar to those taken up by the English Post-office. The Oriental Telephone Company introduced the instrument in that country, and has now subsidiary companies running at Bombay, Calcutta, Madras and Kurrachee. The Bombay company has 350 subscribers, the charges being: for merchants, banks and mills, $75; for shopkeepers, $60; and for private use, $39 per annum. At call-boxes, of which there are eight in Bombay, occasional conversations may be had at a charge of two annas, or about 5 cents. The Blake transmitter and the Gower-Bell receiver are employed, and the wires are principally of phosphor bronze, 17 B. W. G.

Twin Water-Wheels for Electric Lighting.

The Rochester Electric Light Company have recently made an addition to their power plant, in the shape of three pairs of turbines, made by Messrs. James Leffel & Co., and capable of developing 1,000 h. p. The wheels, as shown in the accompanying illustration, are mounted in pairs and are 23 inches in diameter. One of the principal features of the "Twin Mining Wheel," as this one is called, consists in the arrangement by which the "part gate" effect is entirely overcome. This is accomplished by placing the two wheels on the same horizontal shaft, with a separate inlet pipe for each wheel and so arranged that in times of low water one wheel may be run independent of the other; and as the water increases, the gates of the other wheel may be opened sufficiently to receive it. In this manner the greatest percentage of useful effect due to full gateage may at all time be obtained from variable streams of water. The shaft of the machine runs in oil bearings surrounded by water, which insures cool running even at the highest speeds. As the illustration shows, it is a complete machine within itself, being placed on wrought-iron foundation base.



TWIN WATER WHEELS FOR ELECTRIC LIGHTING.

The Electric Light in Collieries.

In a paper upon the "Safe Lighting of Collieries," read at Swinton, England, by Mr. W. E. Teale, the author thus expresses his views on the application of electric lighting: "Electricity for the purpose of lighting collieries will be largely used for surface and underground. Mr. Swan, Mr. Miles Settle and others have given a great deal of attention to the subject. The lamp designed by Mr. Swan consisted of a secondary battery and a small incandescent lamp attached. But so far that system had not obtained any succcess on account of the weight, consumption, and the material the battery was composed of, the trouble of charging, and the cost of the lamp. The lamp might be used with good effect by generating electricity from a dynamo driven on the surface, and the electric current conducted down the mine

by means of a wire, properly insulated, to the shaft bottom, and thence into certain portions of the mines where a fixed light is desirable, such as for lighting the bottom of pits, offices, stabling and along main roads. Great care was needful to use wire thoroughly well insulated, and to fix it in such a position that it could not possibly cause short-circuiting, come in contact with wire, nails, or other metal, and so divert the current; also that the conducting wires might not be fractured, for if that were to occur, and explosive gas existed, the spark produced would inevitably cause an explosion. In order to prevent any possible ignition should the glass of an incandescent lamp be broken and expose momentarily the carbon filament in a state of incandescence, which, if placed in contact with explosive gas, would cause a disaster, Mr. Settle, the inventor of the highly-successful method of blasting by the water cartridge, proposed to surround the lamp with two globes containing water, air, or carbonic acid gas, and in the event of the outer globe being broken then a float would descend and break the contact. Mr. Settle also proposed to carry the wire right into the workings by means of pipes filled with water. At certain places there would be junctions at which couplings might be fixed in connection with a length of flexible tube containing the conducting wires of the lamp attached to the end, which might be hung up in a suitable position to work by. The difficulties in connection with the entire and sole use of electric light were: 1. The lamp did not disclose the atmosphere which a man might have to pass through, and there would, therefore, be the risk of men being suffocated by gas. 2. The colliery would require to be lighted as the streets, courts and passages of a town were, throughout the whole length of the workings where men had occasion to go, either to inspect or to work, or they would have to carry a portable lamp to such places as were not lighted up. 3. The risk attending the fracture of the wire by the ordinary changes and movements of the wind, a fall of roof, or any accident which might place the pit in darkness, or by a spark of great intensity sufficient to ignite gas, should any exist at the points of fracture. 4. The great expense to light up a mine throughout, in some cases the scores of miles in roads and passages."

The Aurora Borealis—An Electrical Phenomenon.

The Finnish *savant*, Professor Selim Lemstrom, well-known for his researches and studies of the remarkable electrical phenomenon, the aurora borealis, has just issued in Swedish, the London *Electrical Review* reports, an important work containing the results of the same. Having referred to the general forms assumed by the phenomenon in the Arctic regions, the *savant* describes the peculiar form observed by him in the North of Finland, viz., a coruscating luminosity around prominent objects, as, for instance, the tops of mountains, houses, etc. This phenomenon, it may be mentioned, Prof. Lemström maintains is a kind of aurora borealis, whereas another celebrated student of the same, Dr. Sophus Tromholt, pronounces it to be a kind of St. Elmo's fire. The professor then gives an account of the periodicity of the aurora borealis in its daily and yearly periods of maximum and minimum, and also of the relations between the phenomenon and the terrestrial magnetic storms and the sun spots. Other parts of the work deal with the geographical extension of the aurora borealis, its height above the earth's crust, the natures and the effects of the terrestrial magnetism and the aurora borealis, concluding with the author's scientific demonstration of the phenomenon being of an electrical nature. Finally, he describes the electrical currents at work in the air, and the experiments he effected in Lapland some few years ago when he succeeded, for the first time in the history of science, in producing an artificial aurora borealis on the top of a mountain by means of a specially constructed discharging apparatus, viz., a network of copper wires on which steel points were fixed at certain intervals. The author gives a very clear and vivid description of the electrical forces at work in the atmosphere or space at a height from the earth of from 40 to 50 kilometres. Thanks to scientific investigations of recent years we now know that these forces are subject to strict natural laws. The aurora borealis is, we learn, an *electrical* phenomenon in a form different to lightning, but still of an atmospheric nature. At a certain distance from each pole is a belt or zone whence a continuous but varying discharge of electricity into the atmosphere takes place. This is the aurora borealis and australis. This theory is now accepted by all leading *savants* as the only natural explanation of the phenomenon, and it has recently been greatly strengthened by the removal of one important point against it, viz., that electricity could not be transmitted through a vacuum or chamber of rarified air, an assumption disproved by Prof. Edlund, the celebrated Swedish physicist, Prof. Lemstrom demonstrates that the aurora borealis has a double periodicity of about 11 and 56 years and that the terrestrial magnetic storms follow the same laws, and that these, too, strange to say, coincide with those regulating the sun spots.

Prof. Lemstrom's work is a valuable contribution to electrical science, and unravels to a considerable extent the mysteries which have hitherto shrouded the nature and origin of the remarkable electrical phenomenon known as the aurora borealis or northern lights.

The Message on the Wires.

BY C. W. M., '77.

My path, one early winter's day,
Over a country road-side lay,
Just where the winds came sweeping down,
Between the hills, beyond the town.

First on the left, then on the right,
Tall, towering poles rose in their might,
Their arms outstretching to uphold
The wires that stretched for miles untold.

Just then the wind came sweeping down,
Between the hills, beyond the town,
And music rose, now soft, now sharp,
Like notes from an Æolian harp.

So soft and low, so sweet and clear,
The notes that fell upon my ear,
Methought the wires broke into song,
Because of thoughts they bore along.

Perchance the word from some dear friend
That days of waiting soon would end,
And those between whom seas had rolled
Should greet each other, as of old.

Just then the wires, swept by the gale,
Gave forth a long and piercing wail,
As if the messages borne along
Caused sighs of pain in place of song.

And now, methought, to some poor heart
Flies news that bitter tears will start—
Perchance some face they've loved to greet,
They never more on earth will meet.

O, magic wires, that o'er the land
Your meshes weave on every hand!
Wondrous your power, for in a breath,
You sing of life, or sigh o'er death.

The swift-winged words you bear along
Cause hearts to break forth into song;
Or to some life, with sudden blow,
You bring the words of death and woe.

—*The Bates Student.*

NEW YORK NOTES.

Office of The Electrical World,
New York, April 4, 1887.

I was last week in the office of the Electrical Construction and Supply Company, Mr. F. E. Kinsman, general manager, 145 Broadway, and witnessed a test of the new Simplex arc lamp, placed in multiple arc on the Edison circuit. It takes a 10 ampère current at 52 volts and furnishes a 2,000 c. p. light. It was shown in a room where gas and other illuminants were burning, and it made them all look dim and cast their own shadows. This effect was specially interesting with the gas jets, the reflection of which as seen on a wall was in a terrible state of agitation, owing of course to the heat generated as well as to natural flicker. The Simplex lamp burned on with sweet serenity as though it knew nothing and cared less for the nervous rival it had so easily put in the shade. The lamp will, it is said, work on all the standard systems. One feature is that it has but four plain movable parts. No variations could be observed in the incandescents in the same circuit. The lamps can be purchased in any quantity by responsible parties.

Archer & Pancoast Manufacturing Company, 67 Green and 72 Wooster street, B. F. Allen, treasurer and general manager, have a large plant and every facility for making electroliers and combination fixtures and brackets. All their special designs and stock can be fitted for electric lighting, with but slight changes. Some of the large edifices where their work can be seen in connection with electric lights are the Indianapolis State House; the Equitable Life Building, New York; Washington Building, New York; Burnett House, Cincinnati; Palmer House, Chicago; Home Insurance Building, Chicago; Stillman House, Cleveland, etc.

I had occasion recently to pay a visit to No. 506 West Fourteenth street, this city, where the Clark dynamo is being exhibited in operation. This machine, which you have already illustrated, has an armature of the Gramme ring type, but its main point of interest consists in the fact that the pole pieces project into the interior of the ring and are there re-enforced by a pair of auxiliary magnets actually within the ring. Mr. E. P. Clark, the inventor, claims that the capacity and efficiency of his machine is thereby largely increased. During my visit there I saw the machine operating twenty Brush 2,000 c. p. arc lights. The engine, of moderate size, was mounted on a tubular boiler, which was fired by crude petroleum, in combination with a water spray. The plant seemed to work nicely, and will repay a visit by those interested. I may add that Mr. Clark is now working on an arc lamp of his own design to be used in connection with his machine.

The William Lang Company, manufacturers of metal goods, 123 to 139 Middleton street, Brooklyn, carry on quite an extensive business. I was escorted through the factory last week by Mr. Robert Brass, the vice-president. It is a substantial brick structure, five stories and basement, 100 × 150 feet. In the basement are a number of ingenious machines for stamping out designs in metal; a big Watts & Campbell Corliss engine; a new style of plant for heating the factory with the exhaust steam; a large draft fan; polishing room; electric and acid baths for plating. The second floor is devoted to preparing goods for market and for shipping. On the other floors are all sorts of machines for pressing out shapes in iron, brass, etc. The concern makes its own dies, tools and machinery. In going the rounds, my attention was naturally arrested by a neat little electrical system for calling up, from the office, the foreman of each floor. It is composed of a magnet, the armature to which moves and sets the hand on a dial, indicating from "one" up, in circuit with which is a gong. All the dials indicate together, so that the foreman wanted, no matter what floor he may happen to be on, gets timely notification. The factory has a complete outfit of all sorts of drills, lathes, planers, etc., and has been very successful on electrical work, such as electric light and motor armatures, commutators, bearings, etc., telephone and telegraph apparatus and specialties—all made with great promptitude and very reasonably.

The United States Electrical Company, 529 Fulton street, Brooklyn, and 41–43 Wall street, have changed the name of their concern to the United States Electric Engineering Company. They will occupy their new offices in this city, 18 Wall street, on May 1. The company have been at work on incandescent lighting machines for some time, with the help of Mr. W. K. Freeman, and they are now lighting their Brooklyn factory, offices and salesroom with fifty 16 c. p. lamps run from a 260 lb. machine.

The Washburn & Moen Manufacturing Company, of Worcester, have just issued the fifth edition of their admirable little "Pocket Handbook of Iron and Copper Wire," giving all kinds of electric facts and figures. It is one of the most useful productions of its class.

I understand that Mr. E. H. Johnson, the president of the Edison Company, will have at his new country house at Greenwich, Conn., one of the most extensive—probably by far the most complete—outfits of electrical apparatus, for domestic use, to be found in this country. It will include everything that is in any way worth having for convenience, as well as many of the little curios and novelties in the invention of which electrical ingenuity takes so much pride. Electricity is employed to guard the house as well as adorn it. All sorts of unexpected things will happen. The festive burglar will not only find the heavy gates fly open at his slightest touch, but by the time he gets a door or window ajar he will have two or three hundred lights to burgle by and will have two or three score of gongs going to drown the noise of his tools. It will be dangerous to carry concealed weapons, as the very atmosphere will be impregnated with electricity to explode them. The house will be full, in fact, of electric lights, bells, clocks, burglar alarms, storage batteries, motors, heat regulating apparatus, electric fire-places, electric fans, etc., etc. Even the grounds and piazzas will have electric illumination, and as the house stands on a hill, the effect from a distance, as well as near by, will be very pretty. The wiring, which, under the circumstances, will be a fine and intricate piece of work, is to be done by Noll Brothers in their very best style.

I hear that remarkable success is being had over in Hoboken with incandescent lights on the arc circuits, especially in the hotels, restaurants, etc. The Little-McDonald cut-outs are used, and the results are very highly spoken of.

Everybody in New York has been talking about the splendid exhibit made by the Julien people, with their storage batteries on the first train ever lit throughout by electricity—as well as heated by steam. The train consisting of six cars came into the New York Grand Central depot, from Boston, on the night of the 30th ult. in a perfect blaze of glory. The passengers were delighted, and the many experts and newspaper critics present expressed their favorable sentiments in a very hearty manner. The chorus of praise in the daily papers next morning was nothing short of phenomenal. A thing must be good when the whole press of this big city unites in commending it. I must say for myself that I have never seen anything to approach it in the way of train lighting, and I am not surprised to learn that other trains on the Boston & Albany, as well as on other roads, are to be lit in the same way. The storage battery is *the* thing.

W. T. H.

NEW ENGLAND NOTES.

Branch Office of The Electrical World,
Boston, April 5, 1887.

In the Howard Athenæum, for the week beginning April 4, Juleene's "Mephisto," Miss Dot D'Alcarn, will perform on the "electric organ." It is said that the effects produced from a single keyboard are those of an organ, harmonium, full orchestra, seven brass drums, Turkish cymbals, triangles, torpedoes, lightning, castanets, bugles, silver tambourines, 30 silver bells, thunder, hail and rain storms, shipwreck and light-house, wind and water mills in motion, mocking birds and cuckoo, anvil chorus, "Musical Soup Kitchen," electric illuminated railway, balloon ascent and electric shocks everywhere. It is said that two tons of wire and machinery and a week of time in adjustment are required to produce these effects. There are twenty-nine miles of cables and wire used, twenty-three electro-magnets, with German silver wire, seven electro-motors, twenty-three contact-breakers, and three intensity coils, the larger permitting a naked spark of ten inches, and it is said to be one of the largest ever brought to America.

The following named gentlemen have been elected directors of the Lord Acoustic Telephone Manufacturing Company, of Boston: Mr. Woodward Emery, Cambridge, Mass.; Mr. James C. Elms, Newton, Mass.; Mr. W. E. O. Childs, Newton, Mass.; Mr. Charles E. Wentworth, Cambridge, Mass.; Mr. Peter N. French, East Weymouth, Mass.; Mr. Alexander R. Brown, of Somerville, Mass.; and Mr. James Harris, of Boston. Mr. Woodward Emery has been chosen president and James C. Elms, treasurer. Everyone of the above named gentlemen are favorably known to the people of this section; and the fact of their names being associated with the enterprise referred to is evidence alone of the merits of the Lord Acoustic Telephone.

The Boston *Globe* published an interesting article on the 31st, giving an account of the cable steamer "Minia," now in harbor here, with neat pen sketches.

The New England Club of Boston entertained Captain Trott, Chief Electrician Hamilton and Dr. Greer of the cable steamer "Minia," at Young's Hotel, Saturday, April 2.

The fire-alarm telegraph system recently installed by Messrs. Pearce & Jones at Salem, Mass., is giving satisfaction.

Mr. John H. Walsh, proprietor of the Centennial Hotel, Brighton, Mass., is the inventor and manufacturer of a cement conduit for underground wires and other purposes.

Some Boston capitalists have purchased and are fitting up a large building in South Boston—Congress street extension—for the purpose of manufacturing carbons.

Considerable interest is being manifested by the citizens of Hallowell, Maine, in the question of having the streets of that town lighted with electricity.

The Malden, Mass., Electric Light Company and the Salem, Mass., Electric Light Company—both using the Thomson-Houston system—have declared dividends recently.

The Newburyport, Mass., Electric Light and Power Company

has decided to make its new building, now in course of construction, nearly double the size at first contemplated.

The Schaefer Electric Light Company, of Cambridgeport, Mass., is in receipt of several orders for its lamps and apparatus as a result of its fine exhibit at the Worcester Electrical and Mechanical Exhibition.

The Pittsfield (Mass.) Illuminating Company, having in use the Westinghouse system of incandescent electric lighting, is increasing the capacity of its station from 400 to 1,500 lights.

The Pittsfield Electric Light and Power Company, doing business in the same city, but a separate and distinct corporation, and using the Thomson-Houston system of arc lighting, will soon increase its arc lights from 80 to over 100.

Mr. Edwin W. Hammer, formerly inspector of isolated plants for the Edison United Manufacturing Company, of New York, has been appointed manager of the Edison Electric Illuminating Company, of Fall River, Mass. Mr. Hammer is a brother to the popular manager of the Edison Central Station in Boston, and being only 18 years of age, is entitled, I believe, to the name of the youngest manager in this country.

Mr. C. G. Tompkins, of the Berkshire Electric Company, Pittsfield, Mass., favored this office with a call last week. He reports that Mr. C. F. James, formerly of Providence, R. I., recently purchased an interest in the above named company.

A dispatch from Halifax, N. S., dated April 1, states in an interview with Superintendent Fisher, of the French Cable Company, that it is the intention of his corporation to immediately begin the construction of land lines connecting its cable at Sydney with Montreal, and there securing ultimate connections with the Baltimore & Ohio and the Canada Pacific systems, and obtaining direct communication with New York independently of its cable from St. Pierre to Cape Cod. He says that the French company will give the best possible service at the lowest possible rate. The steamer "Pouyer Quertier" will arrive from Brest in a few days. He has been appointed electrician to that steamer and will immediately proceed to repair the break in the cable between St. Pierre and Sydney.

Eighteen fire signal boxes are being placed in position in the several departments of the upper Pacific mills, Lawrence. These connect with the watchman's office, and are to be used only when it is necessary to call the City Department in case of fire. Should the fire be discovered in the mill, at any hour, all that will be necessary is to signal the watchman at the gate, who will ring in an alarm at once from the box near by.

The Synchronous Time Company has sold its rights for the City of Boston and seven surrounding cities and towns to the Boston Electric Time Company; and it has arranged also with the Synchronous Time and Service Company, of Chicago, for energetic work in the Western States. The parent company, since its organization last summer has been very successful in its operations. It has already 1,000 of its clocks in actual use, and the prospects are favorable toward the placing of 2,000 more in the hands of customers within twelve months.

Mr. G. A. Smith, formerly with the Schaefer Electric Manufacturing Company, of Boston, has opened an office at Haverhill, Mass., for all kinds of electrical work. He is well known in the locality and is likely to do a good business.

Messrs. Paine & Francis, the New England agents of the Edison United Manufacturing. Company, have recently sold a plant of 100 16 c. p. lamps to the Continental Brewery, Boston.

The Billings & Spencer Co., Hartford, have just added two drop hammers weighing three tons each, making thirty-seven now in operation, besides five tilt hammers and ten hot trimming presses. Almost all the machinery was made by their neighbors, the Pratt & Whitney Co. The company originally started with two drop hammers. They are making a great run now on copper forgings.

The annual meeting of the stockholders of the New England Telephone and Telegraph Company will be held at the office of the company, 144 Greenwich street, in the city of New York, on Monday, the 2d day of May, 1887, at eleven o'clock in the forenoon.

On Thursday (March 24) a bill to regulate telephone rates was reported to the Committee on Mercantile Affairs in the Massachusetts State House. It provides that in a territory with a population of less than 10,000 not more than $3 a month shall be charged for one set or pair of telephones rented by the same party, provided they are operated within one mile of the central office of the exchange, with 50 cents additional for each mile. In places of less than 100,000 population an additional charge of $1 a month may be made, and in exchanges serving a territory of 100,000 or more, the following rates are established:

Within one-half mile of the central office, for special wires limited to one subscriber, for business purposes, $5 per month; for residences, $4. For wires limited to two parties for business purposes, $4.33; for residences, $3.33. For wires having four or more subscribers for business purposes, $3.50; and for residences, $2.50. Fifty cents per month additional to above rates in the territory last described may be charged for each additional half mile of distance from the central office of such exchange.

I have the following points from Mr. E. S. Sears, the energetic treasurer and general manager of the Citizens' Company:

"I see in THE ELECTRICAL WORLD of Saturday that we are about to build a new station "24 by 32 feet, considerably larger than the old one," etc. The building 24 by 32 feet is merely a temporary frame building which was finished and occupied three days after the fire and which we are now using. We *are* about to begin a fire-proof building, 40 by 50 feet, of brick, with iron roof, which will be, I think, one of the most substantial, conveniently arranged and *suitable* electric light stations hereabouts. We have nearly the whole of our new plant in use, and when the building is ready I shall be pleased to have you inspect our station. The outfit will consist of one 60 h. p. New York Safety Steam Power Company's engine; one 50 h. p. Armington & Sims' engine, one 25 light and two 50-light American dynamos, 50 duplex American lamps, 50 single American lamps and about 100 Bernstein lamps of various c. p., from 30 to 125, aggregating about the equivalent of 25 arc lights. John H. Laskey, formerly lieutenant of police, and known as the inventor of the Laskey ship's berth and other inventions, has a machine of his own patent for furnishing power by gravity, established in the building formerly occupied by the Bagnal & Loud Company, on Border street, E. B., running a 15-light Kimball & Davis dynamo, supplying current for 15 Schaefer 16 c. p. lamps. We have also put in eight 30 c. p. Bernstein lamps for him for purposes of comparison. His machine is designed to enable stores, houses, etc., to run isolated plants for their own use, winding up a weight by day and letting it run when power for the dynamo is wanted. It promises to be a most valuable means of supplying power for small isolated plants, if it fulfills present promises."

Electric lighting seems likely to become general all over New England, and it looks as if all cities and large towns would use electric lights to illuminate their public streets. There is one city in Massachusetts that seems bound not to come into line and that is Newton. While all the suburban towns and cities are using electric lights for their streets, the country members of the Newton Council object, and some of the reasons are curious in this age of electricity. One member thinks everybody ought to be in bed by ten o'clock; another says it hurts his eyes, while many of them think it ought to be furnished as cheap as gas. There is a smart little electric light company there, but owing to this objection it is shut down, while Brookline, Waltham, Cambridge, Watertown and Wellesley are lighted by electricity, or are to be soon. An electric railroad has been chartered in Newton, but the City Council want them to pay a cent a passenger into the city treasury, because they do so on a railroad in Baltimore. It is different in Brookline, where two electric railroads will soon be in operation.

A Connecticut River railroad passenger train is now being fitted with appliances for electric lighting, and it is expected that the arrangements will be completed within a few days. The system differs from any now being tested, in that the power is taken directly from the journal on the baggage car, so that there is no delay and no expense in charging the batteries, after the plant is once in. Heretofore the difficulty is using power from the trains has been in getting a uniform rate of speed, as the dynamo must run at a regular speed in order to furnish a uniform light. This difficulty has been met by a speed regulator, the invention of S. H. Barrett and C. E. Barrett, of Springfield. By this appliance, when the dynamo reaches a certain speed it will remain at that point. To obviate any trouble during stops at stations a sufficient amount of electricity is stored in each car and the storage is replenished as soon as the train starts again. The connection between the cars will be by automatic couplings, which work perfectly. The dynamo in the baggage car is self-regulating, and a boy can take care of it. Ten lights will be placed in each car and one on each platform. The system will be applied on a train now heated by steam from the engine, so that there will be no fire in the cars.

The Boston & Albany Railroad may be rightfully termed the pioneers in the field in the successful use of the combined system of electric lighting and steam-heating on its cars. The fast express leaving Boston for New York at 4:30 o'clock on the afternoon of March 30 (arriving in New York 10:30), demonstrated the successful application of electric lights and steam heat generated from apparatus stored on the train. The system of electric lighting adapted for the train is that of the Julien storage battery, which has been tested very satisfactorily during the winter on car No. 90, run on the suburban service. Under the centre of each car there is located a strongly constructed box, in which the storage battery is placed. This battery consists of 60 cells, each 6¼ × 5½ inches and 8 inches high, containing 19 plates, and weighing about 27 pounds. The total weight of the battery is, therefore, about 1,800 pounds. The battery is charged by the New England Weston Electric Light Company, which has put up poles and connections in the car yard near Columbus avenue, where the train is stored while in this city.

From this battery under the car, wires lead to the roof, and are connected with two rows of incandescent lamps depending from the roof. Each car, except the baggage car, contains 22 of these lamps, one, however, being placed over each platform to light the steps when stopping at stations. In the cells is stored enough current to illuminate one car for about thirteen hours, or the time taken in a trip to New York City and return. This current is conducted by wires to a switch-board situated in the end of the car, and by turning the switch the whole car can be lighted. The incandescent lamps are placed in two rows along each side of the roof of the car, and are of 16 c. p. each.

Taking everything into consideration—safety from fire, cleanliness, brilliant light, etc., in addition to the average cost per lamp per hour—it seems as though the electric lamp will soon be proved to be the cheapest, and when that is accomplished the day of oil lamps in railroad cars will be numbered. W. I. B.

PHILADELPHIA NOTES.

PHILADELPHIA, Pa., April 4, 1887.

Business is assuming quite creditable dimensions among the supply houses. Country requirements are growing rapidly. Little municipalities are making pretentious inquiries for electric light plants, and in some cases not remote from this city have completed arrangements for extensive lighting. Wilmington, Del., is among the cities that are interested largely in the new systems of lighting.

The Ft. Wayne Jenney Company, which, by the way, has hardly been here long enough to get an office, has, through the energy and enterprise of Mr. G. A. Wilbur, secured the contract for the plant to be put in at Girard College. There will be seven towers, 125 feet high, with fifty lights, the towers being erected near the walls to light the adjoining property as well as the forty acres included within the walls. The contract price is $10,200, outside of power. The Girard Trust has been negotiating, it is said, for over a year with several companies, but the Western concern carries off the plum. All wires are underground. The Waring cable is used. This is quite an important contract. The Girard Trust is noted for its care, long-headedness and comprehensive and successful business management.

Partrick & Carter have just issued a new catalogue of their annunciator and bell department. It contains much new matter of interest to all engaged in electric bell work. Copies will be sent on application. They are making considerable alterations and additions in their offices and show rooms.

Councils appropriated $5,000 to be expended as far as it would go in the laying of underground wires and fixtures under sidewalks or roadway on Broad street, north of Lehigh avenue, and erecting the necessary poles.

The new municipal administration steps into power this week, and great expectations are indulged in as to improved municipal management. Popular confidence sank to a very low ebb under the existing political management. Municipal control has been feudalized among sixteen or seventeen irresponsible and disconnected "commissions," and this hydra-headed municipal management made it possible to misgovern the city without easily placing a finger on the weak spot. We now anticipate at least a more liberal policy upon the part of councils in the matter of electric lighting as well as in all other departments.

There will be a good many good-sized contracts to be passed around this year in the way of electric lighting of halls, banks, houses, etc., and, as a matter of course, the competition which will be developed will be keen.

A vast amount of new building is contemplated, and the building trades will be overcrowded. Our great industries are exceptionally prosperous.

The Underground Electric Light and Power Company, established here in 1883, which seems entitled to the claim of being the prototype of all such underground companies for electrical conduction, after setting in motion a wave that has since reached all the leading cities, has itself gone quietly on in the even tenor of its way, having put its wires through about three miles of streets, comprising Chestnut street from Broad to Third street (eleven squares), and in Tenth street, from Chestnut to Market. Over this limited field it has been putting in wires, light and power, supplying dwellings, stores and shops. Mr. Walter F. Smith, the superintendent and electrician, whose office is at 123 South Eleventh street, says they are content to make haste slowly, feeling that wherever their wires go they go to stay, and that their plans are sure to be adopted generally.

Electricians, in common with all mechanical representatives, are referring pleasantly to Henry Carey Baird & Co.'s admirable March catalogue of practical and scientific books. Your correspondent is pleased to find it widely distributed here, and some have been led by it to invest the requisite $1.50 in Napier's Manual of Electro-Metallurgy.

The unfortunate collision of an express train on the Pennsylvania road with a street passenger car, in this city, by which nearly a whole family were killed, is suggesting again the necessity of electrical warnings of an approaching train at all crossings. The patentee of the right invention will find legislatures ready to promote his interests by requiring railroad companies to adopt this precaution. It could easily be made to register all distances from one or two miles down to the possible collision point. In the above case the street car got off the track while directly on the crossing, and if any apparatus had been within reach by which a responsive warning could have stopped the train, one young life would have been saved, and the rest of the family would have escaped their crippled condition for life.

Among the future combinations of electricity with other motive forces may be predicted its connection with such admirable inventions as that of the McKinley patent air engines. As aërial expansion and condensation comes nearest to the intangible changes in electrical conditions, this engine should be at once interesting and suggestive to the electrician. Absolute safety, no steam, no water, no regulator, no engineer, no extra insurance, no freezing, no pumps or gauges, are wonderful points to claim in an "engine," and bring it well up *toward* the nearly infinite facilities of electric motors. It is only to be regretted that this unique invention did not originate in Philadelphia.

I hear it hinted that two or three new electrical supply houses will start here soon. D.

PENNSYLVANIA NOTES.

CARBONDALE, Pa., March 29, 1887.

The Carbondale central station of the Electric Light, Heat and Power Company has been in successful operation since Jan. 1. The plant was put in under contract with the Westinghouse Company, and consists of 1,200 16 c. p. incandescent lamps and the necessary dynamos, exciters and converters for operating the alternating system. The company has been very successful, having contracted for and sold all its lamps to the full capacity of the plant, and the light gives such universal satisfaction that applications are made for 400 more lamps, and the company will be compelled to increase the plant 1,000 lamps in the immediate future. The amusing feature of the business has been that the gas company have, in anticipation of increased business, expended $8,500 in improvements, and have advertised a reduction of rates to $2.25 per M. Their liberality meets with a freezing response from consumers, and the officers are kicking themselves for throwing away their surplus. The Electric Company secured the municipal lighting contract, purchased an American 50 light 2,000 c. p. plant, and displaced all the gas and gasoline lamps in the city. Western traveling men say the street lamps are the brightest and steadiest they see anywhere.

The stockholders will build an electrical railway the coming season, connecting Carbondale and Jermyn (4 miles), and they are now considering the relative merits of the storage battery and the overhead wire systems.

Prof. Wm. A. Anthony and his large class in Physics from Cornell University visited the plant this week to inspect the operation of the new alternating system. Mr. J. W. Aitken is president of the company; Mr. E. W. Mills, vice-president; Mr. J. E. Burr, secretary, and Mr. M. Moses, treasurer.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, April 2, 1887.

The Brush Electric Company have come out in a circular in which they say that hereafter they propose to turn out but one grade of carbons and this grade as nearly perfect as it is possible to make a carbon. They recognize the fact that the quality of the light furnished is of the first importance, and think that a few cents per thousand saved by the local companies on their carbons at the cost of efficiency of service is not good economy for any one. The Brush copper-coated carbons will therefore be made hereafter in only one grade, and that the best. The carbons will cost a little more, of course, than the inferior "seconds," but a good light is the main thing. There is no doubt that the prices of carbons have been gradually lowered

until they are down to a point where, if a first-class carbon is furnished, there is little or no profit in their manufacture and sale. I know that this is so from my own talks with the carbon makers. While many of the manufacturers claim that, notwithstanding the low prices, they have kept up the quality of their product, it is only natural and doubtless true that many inferior carbons have been made and sold during the last year. In my opinion the operating electric light companies, while desiring, of course, to purchase their carbons at as close a figure as possible, should not, if they desire to subserve their best interests in the long run, get the price below a point at which first-class carbons can be made and sold with a reasonable profit. I am sure that the local companies agree with me in this, and that they would be glad to know that there was no possible danger of their being induced to buy inferior carbons, and that their assurance of this was that none were manufactured. It is surprising, I think, when you consider the low prices which have prevailed, how well the quality of carbons has been maintained by the companies in general. If it is true, as I am informed, that the carbon manufacturers are hereafter to have a little better prices for their carbons, it will probably be for the best interests of all concerned. The carbon manufacturers certainly cannot afford to make carbons without a profit. A fair price is necessary to the production of a good carbon, and it is needless to say that a good carbon is necessary to the production of a good light.

The Globe Iron and Electric Engineering Works are doing well with their different specialties, and all their different articles of manufacture seem to have real merit. I was recently shown a letter from a Texas electric light company, which gave unqualified endorsement to their ammeter. I believe that one of this company's electric governors can now be seen in the Electrical Supply Company's window at 171 Randolph street, this city.

Mr. J. H. Reid, who represents the Mather system here, will soon have an incandescent plant running in a Clark street restaurant.

At a special session of the Indianapolis City Council, Tuesday night, a resolution was introduced and adopted, authorizing the Central Union Telephone Company to maintain its wires, and make such connections and additions as are necessary to enable the company to furnish a good telephone service.

Referring to this, Superintendent Hockett said: "We intend to continue our business in this city as we have been doing, that is, under the toll system, except that only those stations will be maintained that are fairly remunerative. Those subscribers who do not use their telephones enough to defray the expenses of maintenance will lose their instruments." "Recently," said Mr. Hockett, "we have had a hundred or more requests from business men for telephone service, and they agree to guarantee that it shall be worth at least $5 a month to us. These requests come voluntarily from persons who say they must have the telephones, and it is for this reason that we asked the Council to-night to allow us to put up wires to make the connections. In a general way, our policy will be to maintain stations under the toll system wherever we can do it without loss."

The Illinois Secretary of State has issued a license to John H. Pease, Lorenzo O. Hill, and Edwin A. Pease to incorporate the Gogebic Electric Light Company, at Aurora, with a capital stock of $30,000; also a certificate of consolidation of the Lake Gas Company with the Cook County Electric Light Company, with a capital stock of $800,000, under the name of the Lake Gas Company.

Mr. Alex. Kempt, manager of the Chicago office of the Brush Electric Company, mentions the following installations as being some of their late work: At Haley, Idaho, a central station for incandescent lighting; incandescent plant at La Crosse, Wis.; an arc plant, Oshkosh, Wis.; at Hurley, Wis., an arc and incandescent plant; Menominee, Mich., incandescent plant; and an arc and incandescent plant at Cedar Falls, Ia. This company has also sold the Union Steel Company, Chicago, a large arc plant, and the Government three large arc machines for lighting the canals at Keokuk, Ia.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me the following telephone stock quotations:

Bell of Mo.	$155@$157
Central Union	54@ 55
Chicago	375@ 400
Colorado	20@ 22
Cumberland	80@ 85
Great Southern	30@ 33
Michigan	72@ 73
Rocky Mountain Bell	40@ 45
Wisconsin	105@ 107

W. A. K.

Elgin, Ill., March 29, 1887.

Elgin takes a prominent place in electrical matters as well as every other enterprise taken up by her citizens.

The first electric light plant established was put up in November, 1883, by the Elgin Electric Light Company, Hon. Geo. S. Bowen, president, Van Depoele system, with a contract for lighting the city for a term of years. The tower system is used wholly, consisting of 9 towers, 7 of the Star iron tower and 2 of the Adams mast pattern. One tower in the centre of the business portion of the city, on Fountain Square, 150 feet high, has 5 lamps on, of 2,000 candle-power each; 6 towers form a circle of over one-half mile from the centre, and about same distance apart in the circle, 125 feet high, with 4 lamps of 2,000 candle-power each on each tower; and there is one tower directly east of central tower, about three-fourths of a mile (Adams mast), 75 feet high, with 3 lamps of 2,000 candle-power each; and one Adams mast, 60 feet high, in the centre of the city public park, with one lamp of 2,000 candle-power. This completes the circuit for city lighting, making in all, with an additional lamp on the City Court-House building, thirty-four lamps of 2,000 candle-power each, covering in all a radius of nearly two miles. There is good illumination and a very good imitation of moonlight.

The 5-light tower in the centre of the city and the one in the public city park are on a circuit together, separate from the rest, so that on special occasions, when the general circuit is not needed, they can be used.

The "merchant" circuit—some outside and some inside lamps—averages some forty lights.

The Buckeye engine is used (125 to 140 h. p.) and has been kept running every day without interruption.

The next plant established here is that of the Western Edison Light Company, of Chicago, E. V. Matlack, local manager, commencing operations Jan. 1, 1886, with a plant of 1,000 lamps, used chiefly by merchants for inside lighting.

Water-power has been used, but it has been subject to such hindrances as to necessitate the putting in of a set of boilers and engine. Two steel boilers, 80 h. p. each, from John Mahr & Son, Chicago, are now being put in (two more will be put in soon for relay), also a 150 h. p. engine of the Ide manufacture, with all the latest attachments. The plant now consists of two No. 20 dynamos of 500 lights each, and two No. 10 dynamos of 250 lights each, making a capacity of 1,500 lamps, with arrangements for doubling the capacity as necessity may demand.

At present the circuit is confined to the business portion of the city, but it is the intention soon to extend the plan so as to take in some of the residence portion, as many of the new residences being built are also being wired for the Edison lights.

The circuit is alive constantly, day and night, being utilized as a source of motive power for various uses; a 5 h. p. Sprague is run 10 hours a day, and used by the Advocate and Daily News Printing Co., working all of their presses, which they formerly ran with a gas engine; one 4½ h. p. Sprague motor is used 10 hours each day by the Geo. L. Congdon boot and shoe factory; two ½ h. p. Sprague motors are on coffee grinders in grocery stores; three ½ h. p. motors are on meat-chopping machines in butcher shops; one ½ h. p. motor is in a job printing office (superseding motor power), and a $\frac{1}{10}$ h. p. Bergmann motor is in a dental office. All of these have been in use for several months, and are giving entire satisfaction.

The third and last plant, as far as heard from, is that of the National Electric Company. Capt L. M. Kelly, president. They propose to manufacture their own dynamos, lamps (for arc circuit, Fox's patent) and start in with a merchants' circuit of 25 lamps. They now have some eight lamps in circuit among the merchants, which are doing excellent work, and the plant and manufacture bids fair to be a success. Water-power is used at pre ent, and as a reserve the engine at the D. C. Cook publishing house is utilized, but they expect to have power of their own soon. They also have a brass foundry in connection with their factory, which is a needed addition and a welcome boon to our various manufacturing concerns. By the way, I should have mentioned that the Fox arc lamp is one of the simplest mechanisms yet brought to my notice. It has no complication of cog wheels, spiral springs, etc., but a sort of weight adjustment, making it almost perfect in regulation and government, the carbon feeding thereby giving an almost noiseless and unvarying light in the combustion of the same.

Calling at the office of the Elgin Telephone Company I find every indication of a good business. The sample private line, or club exchange switch-board, now in operation from the residence of Mr. Hubbard, the general manager, connects with neighboring residences, thereby showing the practicability of the Hubbard system for mechanical telephone exchange connections. It is very interesting and novel, to say nothing of the wonderful simplicity and practicability of the device, as there shown. It is fully covered by patents wholly in the control of the company.

CANADIAN NOTES.

Toronto, March 28, 1887.

The Toronto Electric Light Company, of which Mr. J. J. Wright is manager and electrician, has commenced the construction of a new station on the water front in the centre of the city, at the foot of Yonge street. It is intended to meet the growing demand for light and power, and will be fitted with all the most improved appliances. All foundations for stack, engines, boilers and dynamos are being laid on piles driven to the rock. The dynamo room will be 160 × 60, and the motive power will consist of four "Brown" automatic cut-off engines of 150 h. p. each, coupled in pairs, and one 50 h. p. Armington & Sims. An independent condenser and air-pump, driven by a separate direct-acting engine, will be used, of sufficient capacity to take the exhaust from all the engines; and automatic relief valves will be provided, so that in the event of any mishap to the condensing apparatus there will be no stoppage of the engines. The main shaft, running on heavy pillow blocks, bolted to stone-work foundations, will be 55 feet long and 5 inches in diameter, carrying pulleys of 60 inches. The second line shaft, also on the floor, will be 4¼ inches in diameter, with 48-inch pulleys.

The dynamos originally owned by this company were of several systems and produced currents of from 8 to 20 ampères. These have all been remodeled and supplied with new armatures, giving a current of ten ampères, which is now adopted as a standard on all the local arc light circuits. The company have also built in their own shop and have in operation four new dynamos, besides the forty horse-power motor used by them on the electric railroad at last year's exhibition, and have now nearly completed two of the largest arc light machines in existence. They have a capacity of over 100 lights each; but in deference to popular prejudice in the matter of high electro-motive force, they will be arranged to supply two circuits of fifty lights each, or the entire number on one circuit. The armatures are 36 inches in diameter by 24 inches long, and the greatest care has been taken to insure thorough insulation. The coils are made interchangeable and removable and are separated from each other by an air space of one-eighth of an inch besides the insulation. The large size of these dynamos renders it possible to make all insulated parts much stronger in proportion than the increased E. M. F. would call for.

One hundred new double lamps have just been finished and put in operation on the all-night circuits. They are unique in one respect, and that is an important one and worth mentioning, as it overcomes about all of the objections that have heretofore existed against double carbon lamps. The latter comprise two separate and distinct movements, each with its own magnets, combined in one case. The transferring mechanism consists simply of a projection on the first carbon rod, which at the proper time on descending rests on a projection from the binding post or positive terminal of the second lamp. This is absolutely positive in its action and has no complicated triggers or springs which frequently fail in operation, and it is impossible for the current to jump from one carbon to the other, and back again, which is a cause of trouble in a good many double lamps. If one side of the lamp should give out from any cause, the current is transferred to the second, thus insuring a light under any circumstances. The lower carbon holders are carried by a single rod in the centre, which reduces the shadow on the roadway to a minimum. The automatic cut-out, instead of being on the lamp, is placed on the pole independent of both the lamp and the wires leading to it. Owing to this circumstance, and to the fact that reserve dynamos are always kept ready at the station, the light enjoyed by the citizens of Toronto may now be depended on with as much certainty as any other means of illumination.

Experiments are now being made with motors, and it is the intention, as soon as the new station is ready for occupation, to introduce them for light manufacturing purposes where steam is not available. The location is admirably adapted for this purpose, and for the production of current for incandescent lighting, being in the heart of the city. There are extensive wharfage and railroad facilities on the company's property, and the intention is to get down the cost of the principal supplies, water and coal, to a rock-bottom figure, so as to be able to enter into successful competition with any other known mode of illumination, not excepting gas or even coal oil or tallow dips.

The Polson Iron Works Company, of Toronto, have the contract for all the new machinery, and it is their intention to turn out work of such a character that they will be able to point with pride to it as a sample of what they can do when they try.

There has been considerable rivalry in the matter of engines for electric lighting in Canada. High-speed engines were largely used until the Toronto Company made a bold departure from the rule. They took out all their high-speed engines but one, and substituted a pair of coupled automatic engines of 350 h. p. The result of the trial appears in the contract already closed for similar engines for the new station. The Royal Electric Light Company, of Montreal, then made a similar change, putting in a pair of the same size. The Halifax Electric Light Company now comes in line, and the Polson Company are just completing the third pair for them. The Owen Sound Electric Light Company are also running their station with a single automatic engine of the Brown type, 125 horse-power, with condenser.

The Toronto Electric Light Company expect, when their new station is completed, which is anticipated to be by August next, to be in a position to supply current for all purposes either night or day; and as reserve plant, both steam and electrical, of every description will always be kept ready, they will be able to guarantee an uninterrupted supply. Neither pains nor expense are being spared to make this one of the most complete and efficient stations on the continent.

THE TELEGRAPH.

Newark, N. J.—The Newark District Telegraph Company has filed articles of incorporation in the Essex County Clerk's office.

T. M. B. A.—Assessment No. 205 for April for $1 is to meet the death claims of Joseph E. Christie and Ella G. Haseltine.

A Commercial Cable Injured.—Ice in Dove's Bay, Nova Scotia, did damage to one of the Commercial cables. Repairs were made as soon as possible.

Mexican Receipts.—The receipts of the Mexican Telegraph Company for the week to March 26 were $4,717, and of the Central & South American Company, $6,813. Communication by the West Coast telegraph cable was interrupted March 23, cutting off connection with Chili and points beyond.

Suicide of an Operator.—Charles Wallace, an operator and a native of Cork, Ireland, committed suicide last week in Boston by taking poison. He had been out of work for a month, and said he was tired of life and wanted to die. He had been in the employ of the Western Union and Commercial Cable companies.

Bucket Shops.—A dispatch of March 29, from Albany, says: Senator Coggeshall's bill to abolish bucket-shops came out of the Senate Judiciary Committee with a favorable report. The measure provides that it shall be a misdemeanor to engage in that business, and that landlords or lessees of buildings used for the purpose shall be subject to fine or imprisonment.

Western Union Taxes.—Mr. Francis L. Fiske, referee in the case of Massachusetts against the Western Union Telegraph Company, a suit for $10,812 said to be due for taxes, has filed his report. The State Treasurer estimated that the value of the company's property in the State was $750,952, which was to be taxed at the rate of $14.14 per $1,000, making a total tax of $10,618.40. The Master finds that about 70 per cent. of this is exempt from taxation, and that there should be a tax assessed on only $121,695, or about one-fifth as large as that fixed by the Commonwealth.

The French Cable Company.—The report that an exclusive contract had been made between the French Cable Company and the Baltimore and Ohio Telegraph Company was denied last week by the companies named, except in so far as it relates to the acceptance of messages for delivery to the cable company. It is said that while the Western Union Company will forward to their destination messages received by the French Cable Company, it will not receive messages intended for transmission by the cable company. S. F. Austin, the newly-appointed superintendent of the French Cable Company, has entered upon his duties. Mr. Fisher has returned to his post at Sydney, Cape Breton.

Montreal Telegraph Stock.—A special dispatch from Montreal of March 30 says: "Montreal Telegraph stock has been firmly held at figures ranging from 92 to 95. On the belief that the quarterly dividend payable to-morrow would be paid to-day, a large block was purchased on a point that the dividend would be paid, and the stock advanced from 92 to 95. It is asserted that the extra revenue derived from the carnival and the elections will enable this quarter's dividend to be paid, and speculators think if it is, prices will remain steady at present prices. There are 25,000 or 30,000 shares in speculators' hands, which, even at present prices, stands the holders a loss of $300,000 or $400,000.

A Small Engine.—Amos H. Messer, engineer of the Concord Railroad locomotive "Gov. Weston," has invented a new steam engine, for which he has applied for a patent. A small one is now successfully used on the Weston in the generation of electricity for the Judkins electric signal. It is furnished with steam from the locomotive, and works so satisfactorily that others have been ordered, one being used on the Old Colony Railroad and one

at Montreal. Two more will be put on Concord Railroad locomotives immediately. This engine is scarcely larger than a man's hand, but there is no reason why it should not work equally well on a larger scale. Experiments will be made in this direction as soon as a patent is issued.—*Monitor.*

THE TELEPHONE.

Delaware wants a $2 and $3 telephone rate.

Wisconsin.—The Legislature has voted against the $3 rate.

Telephone Rates.—The New York Senate, on March 29, ordered to a third reading the bill fixing telephone rates at $6.50 in New York and Brooklyn.

Jacob Ruppert's Telephone.—The American Bell Telephone Company has begun suit in the United States court against Jacob Ruppert to restrain him from using between his residence and his big brewery a telephone which is claimed to be an infringement.

California.—President George S. Ladd, of the Sunset Company, informs Secretary Barney that all anti-telephone legislation in California this term has failed, and that in two admiralty cases, for damage cases, the company has been successful in recovering over $3,500.

The Government Suit.—At Boston on April 4, Judge Colt, of the United States Circuit Court, sent down an opinion in the great case of the United States vs. The American Bell Telephone Company to test the validity of the Bell patent, denying the motion of the defendant for leave to demur to the bill and also to plead matters in defense.

Erie Prospects.—The Boston *Herald* remarks: Erie telephone moved up to 29. The Arkansas Senate has defeated the Indiana telephone rate bill, 28 to 3. This disposes of all unfavorable legislation against the Erie Company, rate bills having been introduced and defeated in four States and one territory where the company operates. The legislatures of Minnesota, Dakota, Arkansas and Texas do not meet again until 1889. The Ohio legislature, however, meets in 1888.

THE ELECTRIC LIGHT.

Fishkill Landing, N. Y.—Mr. W. Carroll, of Matteawan, N. Y., proposes to put in a plant at Fishkill Landing.

Hanover, Pa.—Mr. F. A. Ziegler is interested in a company that will erect a station at Hanover, to cost $16,000.

Wellsboro, Pa.—Preparations are now being made by the Wellsboro Heat and Power Company to put in a plant.

Waverly, N. Y.—The Brush Electric Light and Power Company, of Waverly, has been incorporated by J. A. Clark and others.

Park Row, New York.—A number of merchants on Park Row have petitioned to have the whole Row lighted by electricity.

Columbus, O.—The Columbus Edison Electric Illuminating Company, incorporated by W. C. Turner and others, has a capital of $100,000.

New York Franchises.—Mayor Hewitt has approved the franchise for the East River Electric Light Company, referred to in another item.

Brooklyn, N. Y.—The Brooklyn Electric Light and Power Company, incorporated by N. L. Cohen and others, has a capital stock of $100,000.

Fernwood, Ill.—The Fernwood Electric Light and Power Company has been formed by L. P. Scoville and others, with a capital stock of $15,000.

Seneca Falls, N. Y.—The Goulds Manufacturing Company has been equipping with a Sawyer-Man plant and has put in two machines with a capacity of over 350 lights.

Minneapolis, Minn.—The Edison Electric Light and Power Company of Minneapolis was incorporated recently with a large capitalization, by A. F. Rockwell and others.

Danielsonville, Conn.—The Keilingly Electric Light Company has obtained a charter. Correspondence on the subject of plant, etc., should be addressed to Mr. F. A. Jacobs, Danielsonville, Conn.

The Statue of Liberty.—It is stated that a lens will be placed in the torch of Liberty, that additional arcs will be placed around the pedestal, and that the interior of the figure will be lighted by incandescents.

Johnstown, N. Y.—The Johnstown Electric Light and Power Company, of which mention has already been made in these columns, has been incorporated by J. P. Miller and others, with a capital stock of $20,000.

The Chicago Gas Trust has been formed, with a capital stock of $2,000,000, to manufacture gas and electricity for illuminating purposes, and for fuel and power. The incorporators are: John O. Wilson, Robert Martin and Frank H. Collier.

Mobile, Ala.—The Electric Lighting Company, of Mobile, has made a contract with the city to do the public lighting for $14,000 a year, for five years, with 155 arc lamps of 2,000 c. p. The matter has been under agitation for at least 18 months, and has been thoroughly considered by the public and the authorities. Mr. O. F. Cawthon, president of the company, has our congratulations.

Train Lighting by Electricity.—We understand that the Electrical Accumulator Company of this city has received orders to fit up two trains with storage batteries for lighting—one on the Fitchburg and the other on the Old Colony road, both running out of Boston, where the cells will be charged by the New England Weston Company from the Stanhope station. This is but preliminary to some very extensive work of the same character.

What the Citizens Want.—The citizens of Harlem held a mass meeting on April 4 to advocate the lighting by electricity of Third avenue, 125th street and Mount Morris. Jordan L. Mott, J. H. Park Smith, D. N. Carvalho and other prominent gentlemen are booming the movement.

New Brunswick, N. J.—The *Home News* of New Brunswick states that the Edison central station in that place is working admirably and gaining a great many customers. It gives an interesting account of a number of residential installations, in many of which special features of beauty and convenience have been introduced.

Economy of Storage Batteries.—It is stated that in one of the plants in this city equipped by the Electrical Accumulator Company, the regular figures taken show a steady and large saving in coal consumption, through the use of storage batteries, as compared with direct supply of current. This may seem paradoxical, but can be easily understood.

Brockton, Mass.—The Edison Electric Light Company, of Brockton, has decided to enlarge its station, and will add more boilers and Armington & Sims Company engines. It is using now about 300 horse-power of boilers and 250 horse-power of Armington & Sims engines. To allow for future increase it has decided to erect a brick chimney of 900 horse-power capacity, and the contract has been given to the Jarvis Engineering Company, of Boston, which will build one of its new style round brick chimneys. The core will be 76 inches at bottom and gradually increasing to 84 inches at top.

Belvidere, N. J.—A special dispatch of March 30 from Belvidere says: The difficulties between Jesse W. Starr, Jr., of Philadelphia, who contracted to furnish this place with electric light, and his creditors were to-day adjusted after several hours' consultation. The plant, which had been seized, was released to-day, and workmen will complete the circuits at once, when a local corporation known as the Belvidere Electric Lighting Company will purchase the outfit.

Platinum Wire.—A well-informed correspondent writes us: "I am aware of the existence of a movement and correspondence looking to an interpretation of the present tariff by which platinum wire, etc. (at present admitted free), will be made to pay 45 per cent. duty." The large and necessary use of the wire for incandescent lamps renders this information highly interesting to incandescent lamp manufacturers, who are naturally striving all the time to lessen the cost of lamp production.

Lighting in Harlem.—On March 30, Major J. R. McNulty, president of the Harlem Democratic Club, set in motion the local lighting plant and lighted 15 arc lamps, scattered along One Hundred and Twenty-fifth street, between Fourth and Eighth avenues, last night. The switch-board was on the wall behind the President's chair, and when the regular business of the club was completed the members hurried out to the street, where a large crowd was already gathered, and at 9 o'clock the street, which had been dismal, was completely illuminated. These 15 lights will be furnished free for the next 90 days by the Harlem Lighting Company. The company has a franchise covering all the territory north of Eighty-sixth street and the Twenty-third and Twenty-fourth Wards. Mr. McNulty made a little speech before he cut the string in which he pointed with pride to the part taken by the club in securing electric lighting for the northern part of the city, and Andrew L. Soulard, president of the company, also spoke.

New York City.—The bids of the Brush and United States companies for city lights from May 1 are at the rate of 65 cents per night. The North New York Company's bid is 55 cents per night. The Harlem Electric Light Company's bid is for 48 cents per night, per 2,000 c. p., and 70 cents for the special lights on Harlem Bridge and the Mount Morris tower. At the meeting of the Aldermen last week the committee on lamps and gas offered a resolution granting authority to the East River Electric Light Company to place conduits and conductors for electrical purposes in the city of New York, and over and under the streets, as may be approved by the Electrical Subway Company. It was also resolved that as compensation for the privileges granted, the East River Electric Light Company shall light the streets or avenues it occupies free of any charge to the city. One standard street electric arc light is to be furnished for every fifty arc lights furnished to other consumers. The motion to adopt the report led to a long discussion, in which it was stated that if it were laid over the company would not have an opportunity to compete with other electric light companies. The report was adopted. No contracts have yet been made.

APPLICATIONS OF POWER.

Reading, Pa.—It is proposed by the Perkiomen Avenue Railroad Company to adopt electricity for their present system.

The Bidwell System.—The Bidwell Electric and Manufacturing Company has placed an experimental railway plant on the lake front, Chicago.

Ithaca, N. Y.—The Daft system is to be put in by the Haines Brothers on their road, the Safety Electric Railway and Power Company doing the work.

Busy on Electric Cars.—The J. G. Brill Company report that they are building 20 cars for the electric railway in New York city and 8 for the Van Depoele road in Montgomery.

San Francisco, Cal.—A section of road, on the Short-Nesmith system, now running in Denver, will be put in operation at San Francisco, on Fillmore street hill. The local Brush Company will furnish the current. A line is thought of from the ferries to Sutro heights. Mr. A. Sutro and other leading Argonauts are interested.

The Beattie Motor.—Some very successful tests have been made lately with the small motor designed by Mr. John Beattie, Jr., of Westport, Mass. The motor is very compact and efficient for its weight. It has been run satisfactorily on the Edison circuit, and Mr. Beattie has also a primary battery for it of considerable staying power and of cheap materials.

A New Form of Cable is being tried in Brooklyn. It runs very near the surface of the street, and is composed of square links with which the car makes its connection, and is so pulled along. It is said that the whole juvenile population along the route is getting free rides by hooking door mats, boards, tin pans, etc., into the links, each thus having his special cable car.

Ansonia, Conn.—A dispatch from Ansonia of April 2 says: A company with $50,000 capital stock has been organized here for the construction of an electric railway three and one-half miles long, extending from the steamboat landing at Derby to Birmingham and Ansonia. Wires strung overhead will conduct the electric current, the motive power for which will be furnished by the Housatonic dam, one of the largest in New England.

Will Take the Lead.—In the *Street Railway Journal*, Mr. W. P. Craig, after a close examination of the various electric railway systems, and judging from twenty years' experience in the business, says: "I have come to the conclusion that electricity is the coming motive power for street railways, but like every innovation and improvement of such magnitude and importance, it will take time to perfect it so that it will be reliable and satisfactory under all circumstances." Exactly. Electricians don't claim perfection, but "they get there all the same."

Brooklyn, N. Y.—The proposition to build a street railroad through Montague street, Brooklyn, from Court street to Wall Street Ferry, has aroused opposition already, although the Brooklyn Heights Railroad Company was organized only a few days ago. The directors of the company, which is capitalized at $150,000, met on April 4 and elected these officers: President, S. B. Chittenden, Jr.; vice-president, John J. Pierrepont; treasurer, Michael Chauncey; secretary, G. W. Chauncey. The executive committee consists of M. Chauncey, Otto Witte and W. A. Brown. The company is an outgrowth of the Brooklyn Heights Cable Company, organized a year ago, but after examining various systems, the directors wisely concluded that electricity would make a better motive power than a cable, so the term cable was discarded.

PERSONALS.

Mr. G. A. Smith, formerly with the Schaefer Electric Manufacturing Company in Boston, has established himself as an electrical engineer and contractor, at Haverhill, Mass.

Mr. Maurice B. Flynn is credited with the evidence now being given in the McMahon suit as having said: "I am the Subway Construction Company." Mr. Flynn is not usually rash in his statements.

Mr. T. A. Edison.—A representative of the New York *World* has called upon Mr. Edison at Fort Myers, Fla., and finds him anything but a sick man. With Mr. Gilliland, he is working on something new, and has besides just fitted up a little plant to do local lighting gratis for the natives.

Mr. J. R. Reavis sent off by cable from London one day last week to the New York *World* 4,500 words. Here is enterprise with a vengeance that no London journal could for one moment compare with. I hear the *World* spends £10,000 a year in cabling from London and Paris.—*Paris Register.*

Mr. Sidney Z. Mitchell, of the firm of Mitchell & Sparling, Seattle, W. T., is East on a tour of inspection. The firm represent Edison interests chiefly, and have done much to promote electric lighting in the far West and along their section of the Pacific slope. They have even carried the light across the border into British Columbia and Vancouver's Island. Mr. Mitchell is one of the active, progressive young men who have graduated from the Naval service into the electrical business.

MISCELLANEOUS NOTES.

They Do.—Everybody interested in electrical matters should read THE ELECTRICAL WORLD.—*Sanitary Plumber.*

Buffalo, N. Y.—The Associated Conduit Company, of Buffalo, N. Y., has been formed by J. Adams and others, with a capital of $50,000.

The Jury's Verdict at Buffalo, on the Richmond Hotel fire, recommends that wires go underground, so as not to interfere with fire department work.

The Kitson Electric Company, of Camden, N. J., has been formed by G. L. Kitson and others, with a capital of $300,000, to make electric wire, etc.

Philadelphia.—Correspondence in the New York *World* from Philadelphia complains of the neglected state of Benjamin Franklin's grave there. It was illustrated by us Feb. 12.

McMahon vs. Flynn.—Evidence is still being taken in the suit of W. McMahon against M. B. Flynn, Justice Kelly *et al*, for amount due him under a contract relating to early subway negotiations in this city.

New York Subways.—The new bill for the subways is the result of a compromise, and will in all probability be passed. It will provide for five or six commissioners, including the Mayor, the Comptroller and the Commissioner of Public Works.

A Good Example.—A druggist in Brattleboro, Vt., has connected every bottle containing poison with the prescription desk by electricity, so that whenever one is touched a bell gives warning, and wakes the compounder up to see, by a second look, whether he has the bottle he wants or not.

Patent File Indorsing.—A New England subscriber writes us: "I notice in your last issue a communication from Mr. S. S. Wheeler, suggesting a system of indorsing patents on the outside pages for easy reference. The plan is a good one, and one that would prove of great convenience to all persons having occasion to handle copies of patents more or less; and if any one will undertake to engineer a petition to the patent office to have the patents so marked, I can promise you the names of two corporations." Our correspondent represesents very large interests, both mechanical and electrical.

Fire Engine Lighter.—An engineer of the St. Louis Fire Department has invented a little electric machine—the whole placed in a cigar box—which does away with having to keep the gas burning all the time in order to be ready to light the fire for steam. It is so arranged that "when the engine starts a sort of comb-like spring scrapes the gas burner, which sends up a flame

about three feet high, igniting the shavings in the fire-box." The cost of these electric lighters is only $5 for each machine, and they will be at once adopted by the St. Louis Fire Department.

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts, cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

Electric Gas Lighter.—The new electric gas lighter sold by the Electric Brush and Ozone Company, 102 Fulton street, N. Y., is meeting with a large sale. Several agencies have been established, and it will be well for those desiring to handle a good salable article to apply as early as possible. See card, page iii.

Chas. A. Schieren & Co.—The copartnership heretofore existing between Chas. A. Schieren and Jacob R. Stine, under the firm name of Chas. A. Schieren & Co., has been dissolved by limitation. Chas. A. Schieren will continue the business as heretofore, and in the old name and style. F. A. M. Burrel will be connected with the house as formerly.

H. Andres, 22 and 24 North Fourth Street, Philadelphia.—The only genuine raw-hide goods made in the United States. Belting, lacing and straps of all kinds or hard raw hide, lathes, planers, lubricators, fans, blowers, vacuum and steam pumps, cotton and leather belting, emery wheels and machinery of all kinds.

Change of Address.—The Vitrite & Luminoid Company will remove on or before May 1 from Dey street to 182 Fulton street, corner of Church, in order to find room for their increasing business.

Free to Electric Light Co. or any Engineer.—Enough "Eureka" packing to pack a box. Guaranteed superior to anything on the market. 75c. per lb. HINE & ROBERTSON, 12 Cortland St.

Magnetized Watches.—A Giles anti-magnetic shield was recently put in the watch of one of the editors of THE ELECTRICAL WORLD by Mr. John F. Krugler, of 36 John street, this city. The tests it has been submitted to prove that there is not the least danger of magnetization now, even with the closest approach to dynamos in operation. The work has been neatly done, and no one would notice the shield unless his attention were drawn to it.

Steam Economy.—The different engine companies of this country realize that to get the best results in economy it is necessary to have the best possible boiler setting, so as to obtain the largest evaporation for a dollar's worth of fuel. Among the engine concerns in this country who have set boilers with the Jarvis boiler setting are the Harris-Corliss Engine Company, Providence, R. I.; Armington & Sims Engine Company, Providence, R. I.; Southworth Foundry and Machine Company, Philadelphia, Pa.; Ball Engine Company, Erie, Pa.; Woodbury Engine Company, Rochester, N. Y.; Erie City Iron Works, Erie, Pa.; John T. Noyes Manufacturing Company, Buffalo, N. Y.

STOCK QUOTATIONS.

The following list, compiled by Mr. W. H. Baker, member New York Stock Exchange, 16 and 18 Broad street, gives the current quotations of electrical stocks:

April 5, 1887.

TELEGRAPH.	Bid.	Asked.
Am. Dist.	.....	.....
Am. Tel. & Cable	75	77
Cen. & So. Am.	95	100
*Com. Tel	.....	.....
*Gold & Stock	.....	.....
*Inter. Ocean Tel.	.....	.....
N. Y. Mutual	75	80
Pac. & Atl.	48	54
*Postal T. & C.	25	35
South. & Atl.	63	75
W. U. Tel.	77⅝	77¾
W. U. Scrip	73	75
W. U. Bonds	119	.....
Mut. U. Bonds	88	89
TELEPHONE.		
Am. Bell	224	225
Am. Speaking	110	120
Erie	28	28½
*Hudson River	.....	58½

TELEPHONE.	Bid.	Asked.
Mexican	1⅝	1¼
*N. Y. & N. J.	87½	92
N. Y. & Pa.	.....	.....
New England	43½	44
*Southern Bell	120	130
ELECTRIC LIGHT.		
*Am. Electric	.....	.....
*Brush	.....	.....
*Brush Ill.	.....	.....
*Consolidated	.....	.....
*Daft	.....	.....
*Edison	205	.....
*Edison Ill	.....	.....
*Edison Isolated	95	105
*United States	.....	.....
*U. S. Ill.	95	100
MOTOR.		
*Daft	.....	.....
*Sprague	.....	.....

* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED MARCH 22, 1887.

359,593. Automatic Electric Air Brake; J. T. Carpenter, Berlin, Germany. Application filed Nov. 10, 1886. A new valve mechanism and electrical devices for operating it are provided, together with other details, whereby all the brake-shoes are operated practically at the same time, to avoid shocks usually caused by the successive slowing up of the cars of a train.

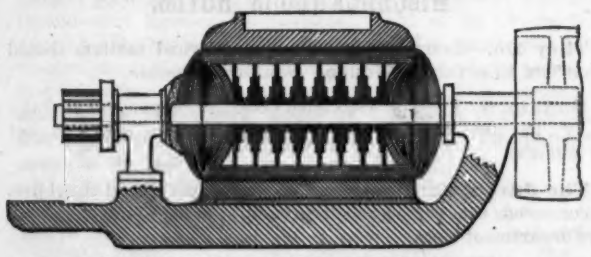
359,607. Electric Railway; J. W. Heysinger, Philadelphia, Pa. Application filed Feb. 9, 1886. Details of construction in all the principal parts of an electrical railway are worked out.

359,619. Combined Volt and Ampere Meter; R. Macrae, Baltimore, Md. Application filed April 30, 1886. In this device the field magnets are arranged at right angles to the axis of the coil or coils and are connected by a rod and a left and right hand screw for their operation.

359,622. Mode of Setting Telegraph Poles; Wm. Murray, Minneapolis, Minn. Application filed June 15, 1885. A caisson for inserting poles in quicksands, consisting of a cylinder in two parts hinged together.

359,673. Apparatus for Controlling Low Pressures; M. W. Grovesteen, New York, N. Y. Application filed Dec. 17, 1885. The object of this invention is to provide automatically operating mechanism which shall maintain any required pressure approximately constant at one and at various different points which may be more or less distant.

(1) 359,686. Municipal Signal Apparatus; (2) 359,687. Municipal Signal Apparatus; (3) 359,688. Municipal Signal Apparatus; (4) 359,689. Individual Call for Telegraph Municipal Systems; B. J. Noyes, Boston, Mass., Assignor to the Municipal Signal Company, of Portsmouth, N. H. Applications filed respectively May 5, May



359,748. DYNAMO ELECTRIC MACHINE.

5, May 12 and July 26, 1886. (1) (2) (3) These inventions have for their objects simplicity and efficiency in apparatus, by means of which different signals may be transmitted from sub to central stations to meet the requirements of a municipal system. (4) A signaling device for systems described in 1, 2 and 3.

359,690. Electric Battery; K. Pollak, Berlin, Germany, Assignor to Deutsche Edison Gesellschaft fuer Angewandte Elektricität, of same place. Application filed Aug. 6, 1885. Copper and zinc plates are alternately suspended in the cells of a partitioned vessel. The zinc plates are covered with a tissue paper prepared with tannic acid. See illustration.

359,713. Electric Lighting System; F. A. Cheney, Troy, N. Y. Application filed Sept. 28, 1886. In this system the current is divided into branches and devices are so arranged that resistances may be thrown into either branch to compensate for the cutting out of a translating device on a branch.

359,726. Electrical Conductor; E. H. Johnson, New York, N. Y. Application filed Aug. 13, 1884. This conductor is designed to prevent the setting of fires by leakage of the current.

359,738. Underground Conduit for Powerful Electric Currents; G. B. Pennock, Brooklyn, N. Y. Application filed April 21, 1886. The conductors are imbedded in a solid, impermeable, heat-proof mass, which is packed with mineral wool, and the whole contained in a wooden box.

359,739. Regulator for Electric Circuits; J. A. Powers, Troy, N. Y. Application filed Oct. 8, 1886. This is a similar invention to that described under No. 359,713.

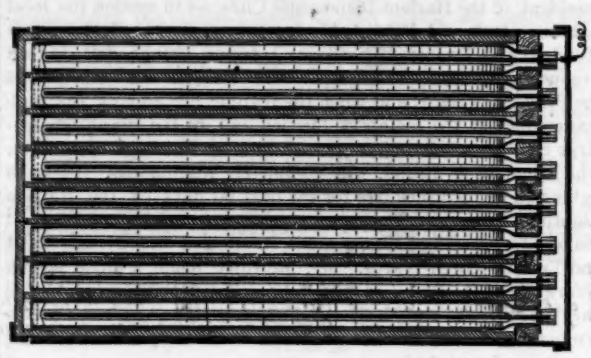
359,747. Toll-Collecting Apparatus for Public Telephone Stations; J. H. Tabony, New Orleans, La., Assignor of one-half to A. Violett, of same place. Application filed Nov. 12, 1885. In this device the collection of tolls is performed entirely by mechanical and electrical means.

359,748. Dynamo-Electric Machine; N. Tesla, of Smiljan Lika, Austria-Hungary, Assignor to the Tesla Electric Light and Manufacturing Co., of Rahway, N. J. Application filed Jan. 14, 1886. The objects are to increase the efficiency of the machine and to facilitate and cheapen the construction. See illustration.

359,770. Dynamo Regulator; C. L. Buckingham, New York, N. Y. Application filed Aug. 5, 1886. This is a device whereby the positions of the brushes of a dynamo may be automatically changed to follow the changes in the position of the neutral line.

359,805. Electrical Synchronal Escapement; J. F. McLaughlin, Philadelphia, Pa. Application filed Nov. 12, 1886. Brake-shoes made in one piece with the armature of two magnets, bear upon the shaft or a pulley thereon of a motor. Upon the power of the magnets depends the regulation of the motor.

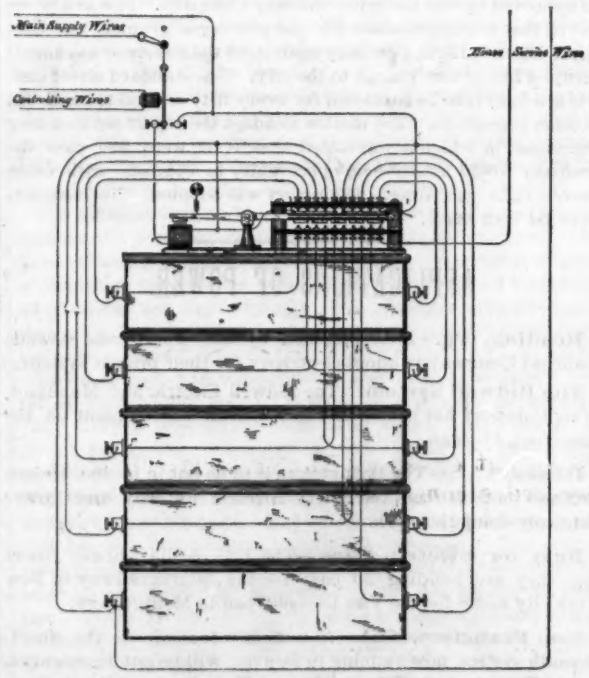
359,812. Insulator for Supporting and Holding Electric Wires; H. Pennie, New York, Assignor of one-half



359,690. ELECTRIC BATTERY.

to Louis C. Schleip, of same place. Application filed April 14, 1886. A block of insulating material, provided with a slot for receiving the wire and with a device for holding the wire in place.

359,816. Terminal for Telegraph Lines; W. H. Sawyer, Providence, R. I. Application filed Oct. 7, 1886. A box provided with a lid or cover, and the opposite end with a perforated bottom having an inner lining of soft rubber and a central opening for the reception of the end of the cable, the in-



359,901. MECHANISM FOR CHARGING SECONDARY BATTERIES.

terior of the box being filled with with a sealing compound. See illustration.

(1) 359,823. Electric Fire and Burglar Alarm; (2) 359,824. Electric Circuit for Telephone and Fire and Burglar Alarms; S. Taussig, Prague, Austria-Hungary. Applications filed June 24, 1886, and Nov. 23, 1886, respectively. (1) This is a system consisting of central station, any number of sub-stations with circuits and signal apparatus, whereby a fire or burglary at any particular sub-station will be reported at the central. (2) This is a peculiar arrangement of circuits in a system similar to (1).

359,825. Insulating Material; C. M. Thompson, Brooklyn, N. Y. Application filed May 4, 1886. This material is a compound of pitch and old rubber or "shoddy."

359,835. Battery Zinc; John Beattie, Jr., Westport, Mass. Application filed Oct. 22, 1886. Sheet lead with a small quantity of arsenic is placed in a ladle and heated sufficiently to dissolve the lead. Then a small quantity of carbonate of sodium is added, after which the mass is allowed to solidify in molds. It is then placed in molten zinc, when the amalgam will be attacked by the heated zinc and taken up.

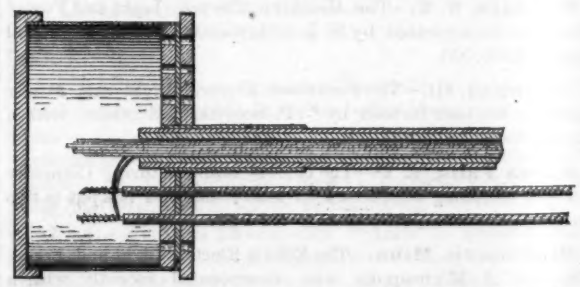
359,866. Cellular Furnace for Baking Carbons; J. Hill, Cleveland, Ohio. Application filed March 24, 1886. The furnace is lined with a series of cells in which the carbons are placed for drying.

359,876. Process of Preparing Secondary Battery Plates; A. V. Meserole, New York, N. Y., Assignor to the River and Rail Electric Light Company, of West Virginia. Application filed Nov. 18, 1886. The plates are prepared by first placing them in a bath of an alkali solution, then in a bath of an acid solution, and again in a bath of an alkali solution, and subjecting them while in such baths to the action of electric currents.

359,877. Secondary Battery; A. V. Meserole, New York, N. Y., Assignor to the River Rail and Electric Light Co., of West Virginia. Application filed Dec. 1, 1886. The positive and negative pole pieces or plates are immersed in a bath of mercury and zinc solutions. For description see page 180 this issue.

359,894. Dynamo Electric Machine; R. J. Sheehy, New York, N. Y. Application filed Nov. 7, 1882. This invention relates to the construction and to the application of certain devices for determining the nature and regulating the strength of the currents.

(1) 359,900. (2) 359,901. Mechanism for Charging Secondary Batteries; Eli T. Starr, Philadelphia, Pa., Assignor, by mesne assignments, to the Electrical Accumulator Co., of New York. Applications filed respectively Nov. 23 and Dec. 4, 1882. (1) The object is to break the working cir-



359,816. TERMINAL FOR TELEGRAPH LINES OR CABLES.

cuit of the battery at the time of charging it for the purpose of safety; also to prevent other batteries from being included in the same circuit to be acted upon by the charging current. (2) This consists of mechanism for charging and discharging secondary batteries, whereby a series of batteries or secondary cells are charged in multiple arc or by branch wires and discharged in series for intensity. See illustration.

359,916. Electric Lamp Frame; T. H. Brady, New Britain, Conn. Application filed Sept. 16, 1886. This is an arrangement for mounting lamp frames on the top of poles and for connecting the line wires so that they will not become detached when the insulator breaks.

359,934. Secondary Battery; Wm. Main, Brooklyn, N. Y., Assignor to the River and Rail Electric Light Company, of West Virginia. Application filed Nov. 18, 1886. An electrode consisting of several layers or sheets of lead, platinum or other suitable material secured together and peforated to admit the passage of the electrolytic fluid.

359,940. Lightning Rod Standard or Brace; T. H. Patee and S. R. Lawshe, Greencastle, Ind. Application filed May 8, 1884. This brace consists of three metallic rods twisted together at their upper sections and parted below to form a tripod to rest on and be secured to a base. The twisted portion supports the rod.

359,982. Coupling for Electric Conductors; F. C. Plume, Thomaston, Conn. Application filed April 30, 1886. This coupling is adapted to separate when severe strain is brought on the line.

359,984. Telephone Signal; C. R. Swain, Peekskill, N. Y., Assignor of one-half to Wm. D. Southard, of same place. Application filed March 19, 1884. The objects are to give notice to persons who may have been absent from their rooms or places of business of the ringing of the telephone call during such absence, and by a supplemental device to give notice at a distant point of the ringing of the telephone call.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.